Access to distributed marine databases on the Baltic Sea

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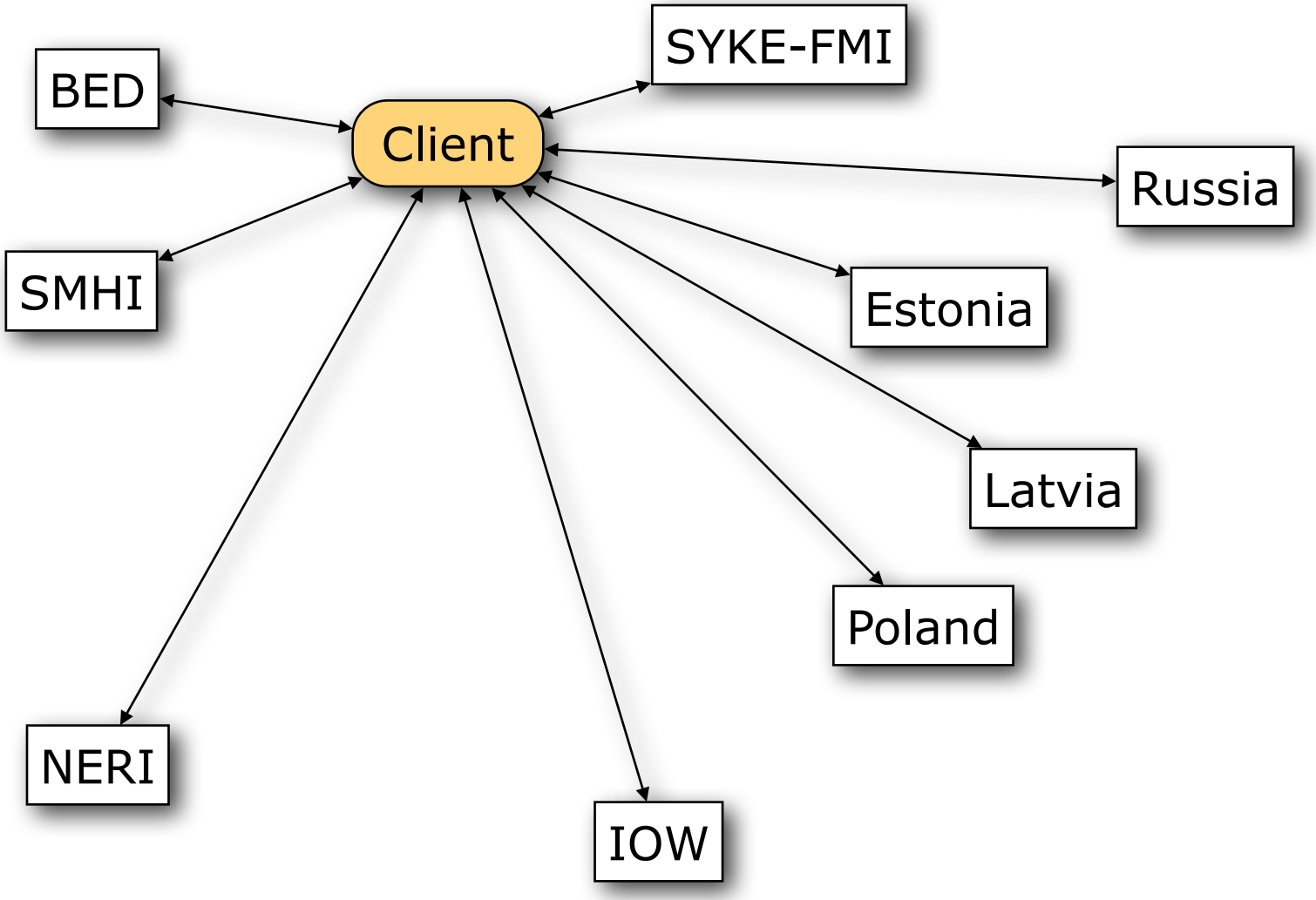
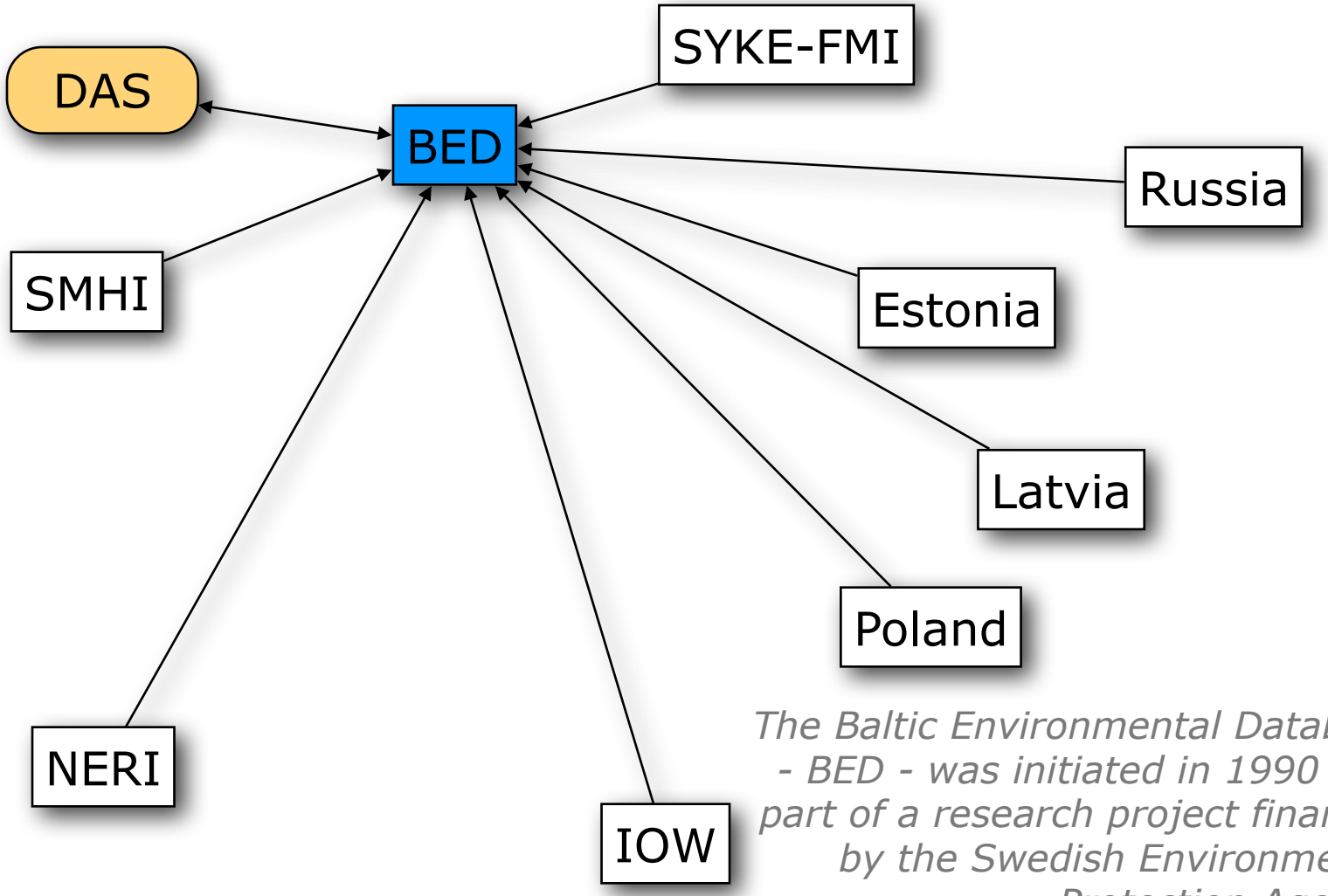
1 - Baltic Nest Institute, Stockholm University Baltic Sea Centre, Sweden
2 - Swedish Meteorological and Hydrological Institute, Sweden
3 - Leibniz Institute for Baltic Sea Research, Germany
4 - Marine Research Centre, Finnish Environment Institute, Finland
5 - Department of Bioscience, Aarhus University, Denmark
6 - Simsoft Oy, Finland
7 - Finnish Meteorological Institute, Finland

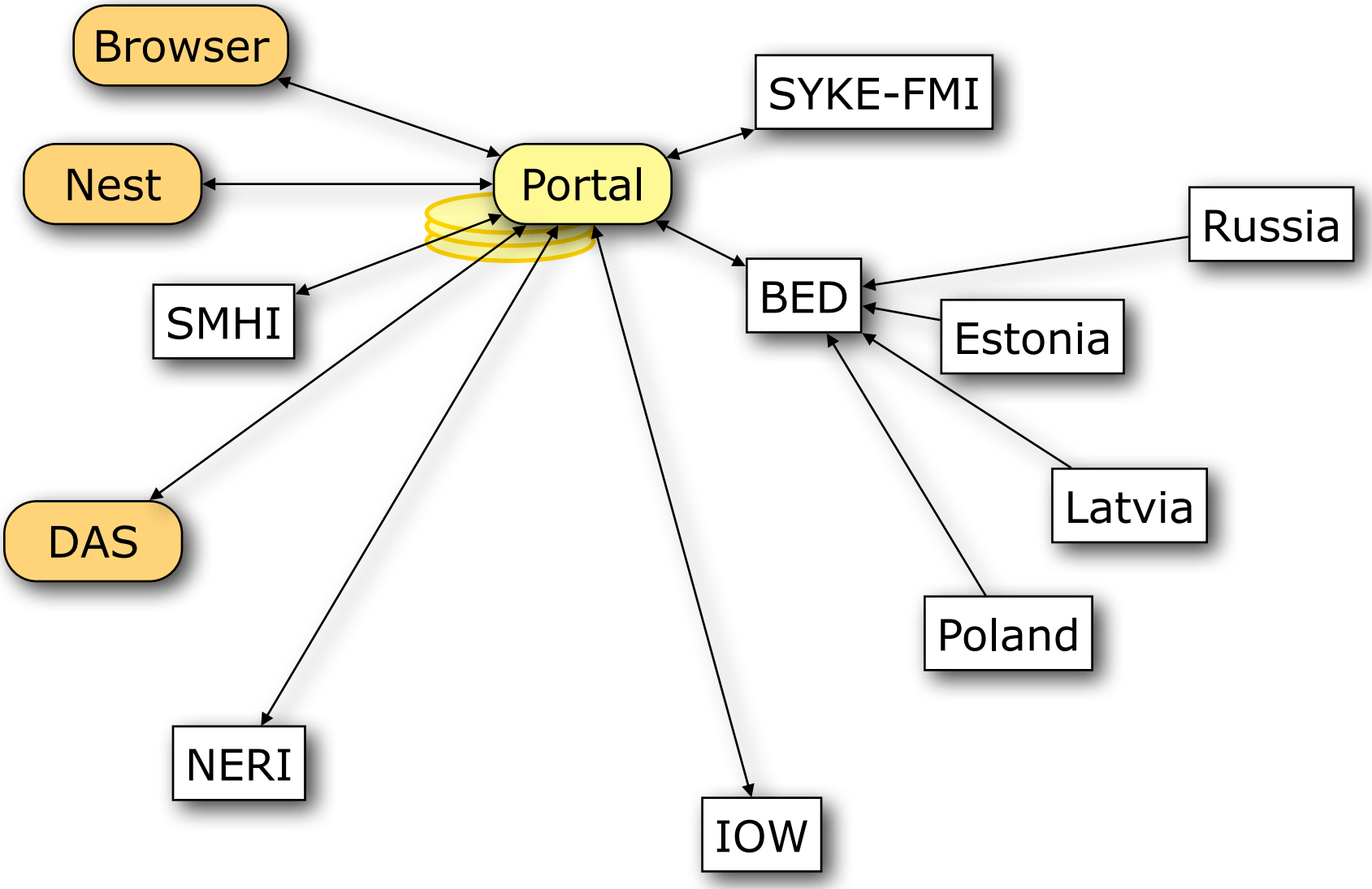
Stockholm University


BED
SYKE-FMI
Client
Russia
SMHI
Estonia
Latvia
Poland
NERI
IOW



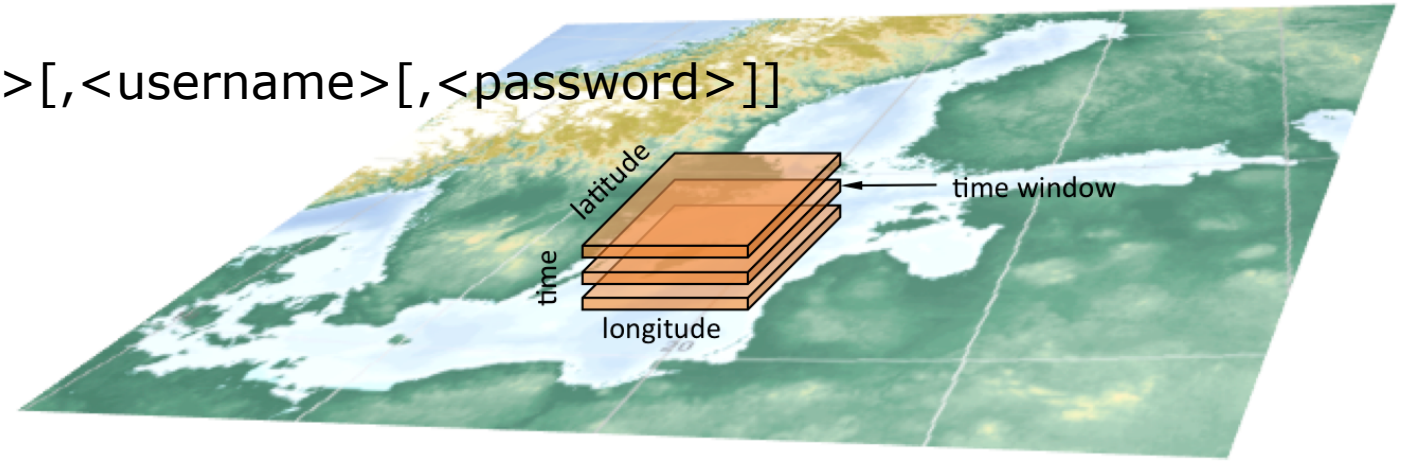
The Baltic Environmental Database - BED - was initiated in 1990 as a part of a research project financed by the Swedish Environmental Protection Agency. BED available online since 1995

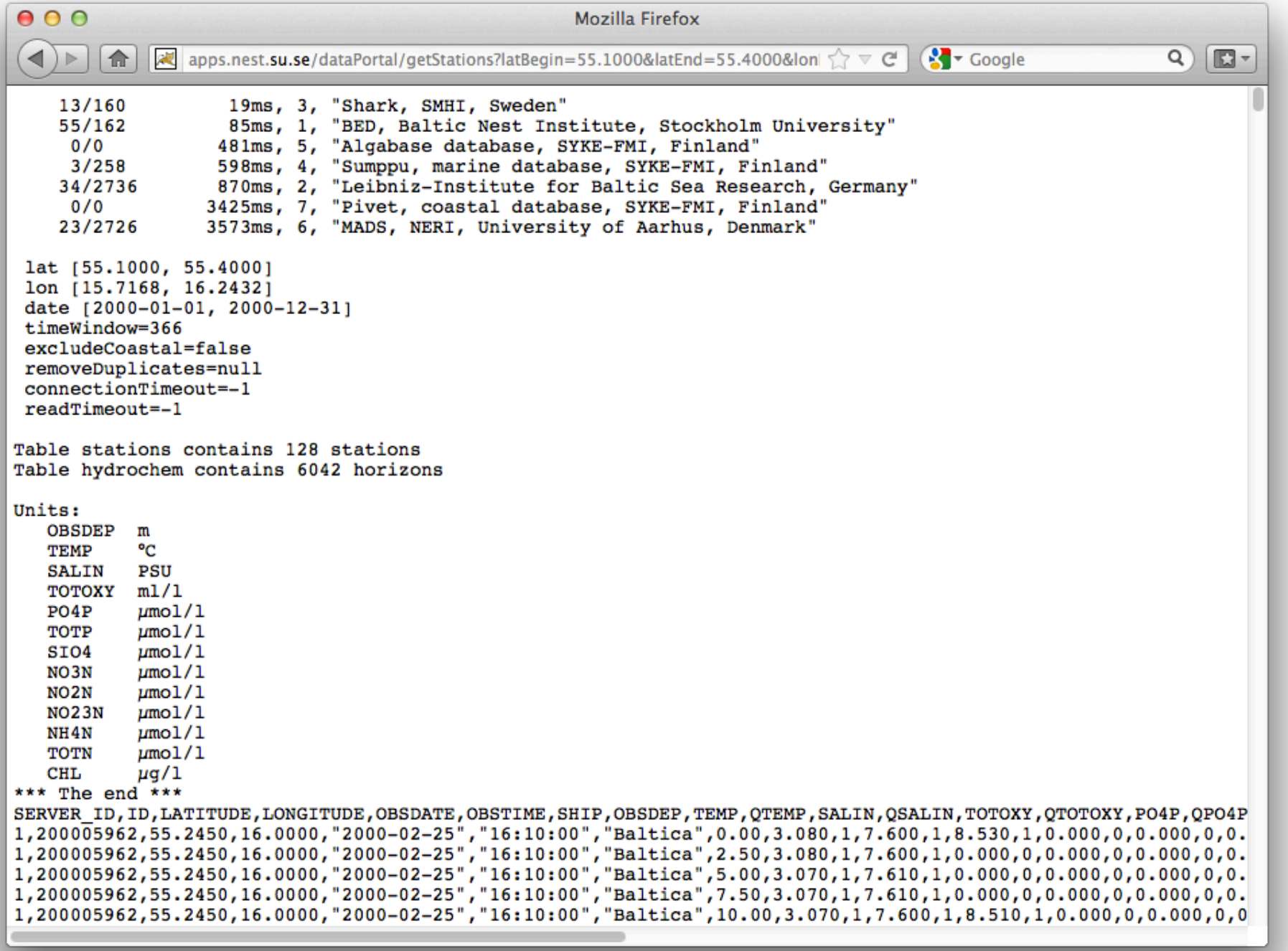
```
sokolov@bed:~$ isql-fb apps.nest.su.se:baltic -u sysdba -p xxx
isql-fb apps.nest.su.se:baltic -u sysdba -p xxx
Database:  apps.nest.su.se:baltic, User: sysdba
SQL> select count(*) from station;
      COUNT
============
     276461

SQL> select count(*) from hydro;
      COUNT
============
    2980778

SQL> select count(*) from chem;
      COUNT
============
     775480

SQL> quit;
sokolov@bed:~$ date
Fri Apr 19 16:38:53 CEST 2013
```


Browser
SYKE-FMI
Nest
Portal
Russia
BED
SMHI
Estonia
Latvia
DAS
Poland
NERI
IOW

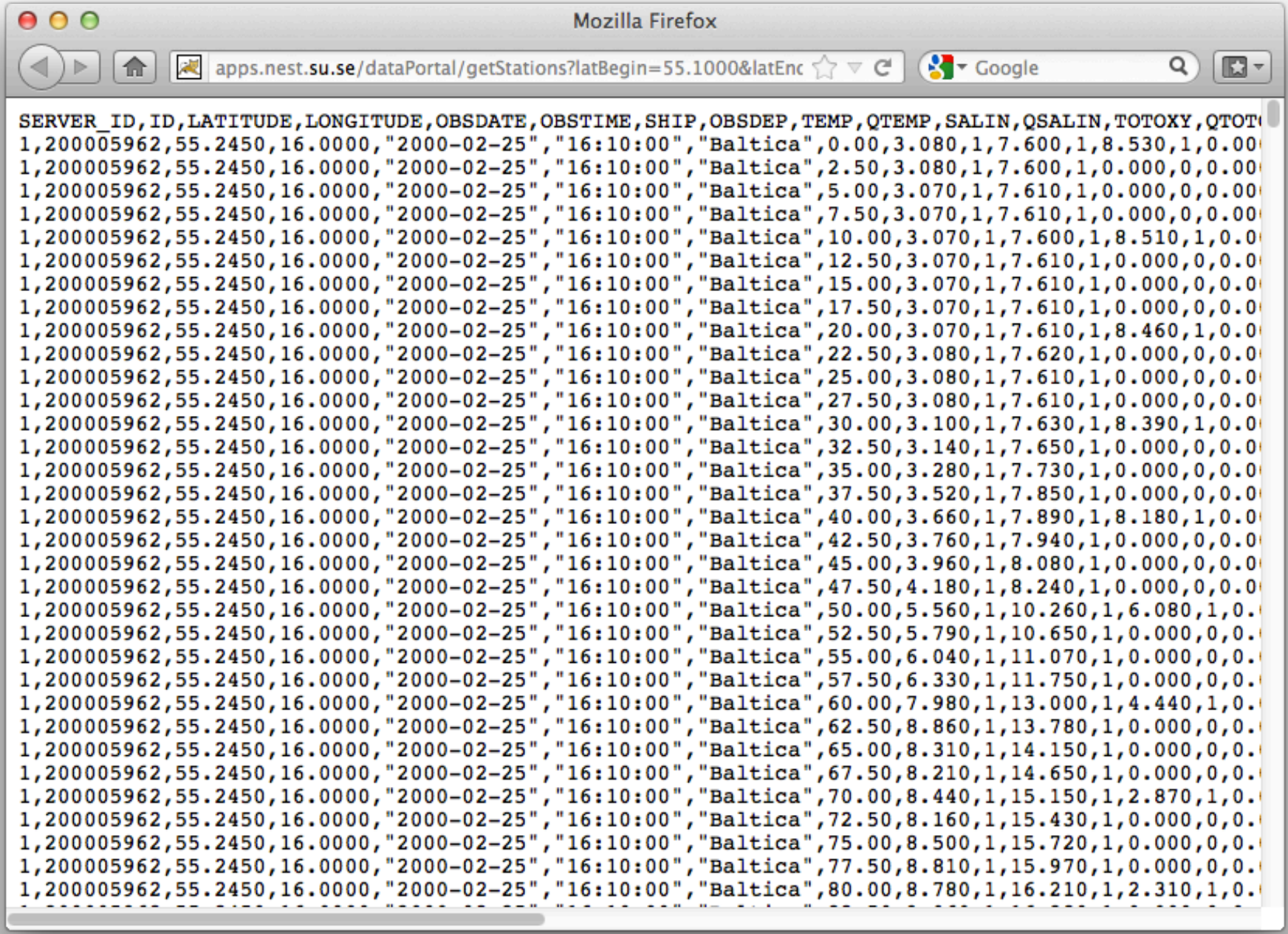
Data portal

http://apps.nest.su.se/dataPortal/getStations[?
  latBegin=<degree>&latEnd=<degree>&
  lonBegin=<degree>&lonEnd=<degree>&
  dateBegin=<yyyy-MM-dd>&dateEnd=<yyyy-MM-dd>
  [&timeWindow=<days>]
  [&excludeCoastal]
  [&verbose]
  [&connectTimeout=<seconds>]
  [&readTimeout=<seconds>]
  [&removeDuplicates=<timeDiff_minutes>,<distance_miles>]
  [&database=<id>[,<username>[,<password>]]
                ...
  [&database=<id>[,<username>[,<password>]]
]






```
    13/160          19ms, 3, "Shark, SMHI, Sweden"
    55/162          85ms, 1, "BED, Baltic Nest Institute, Stockholm University"
     0/0           481ms, 5, "Algabase database, SYKE-FMI, Finland"
     3/258         598ms, 4, "Sumppu, marine database, SYKE-FMI, Finland"
    34/2736        870ms, 2, "Leibniz-Institute for Baltic Sea Research, Germany"
     0/0          3425ms, 7, "Pivet, coastal database, SYKE-FMI, Finland"
    23/2726       3573ms, 6, "MADS, NERI, University of Aarhus, Denmark"

 lat [55.1000, 55.4000]
 lon [15.7168, 16.2432]
 date [2000-01-01, 2000-12-31]
 timeWindow=366
 excludeCoastal=false
 removeDuplicates=null
 connectionTimeout=-1
 readTimeout=-1

Table stations contains 128 stations
Table hydrochem contains 6042 horizons

Units:
   OBSDEP  m
   TEMP    °C
   SALIN   PSU
   TOTOXY  ml/l
   PO4P    µmol/l
   TOTP    µmol/l
   SIO4    µmol/l
   NO3N    µmol/l
   NO2N    µmol/l
   NO23N   µmol/l
   NH4N    µmol/l
   TOTN    µmol/l
   CHL     µg/l
*** The end ***
SERVER_ID,ID,LATITUDE,LONGITUDE,OBSDATE,OBSTIME,SHIP,OBSDEP,TEMP,QTEMP,SALIN,QSALIN,TOTOXY,QTOTOXY,PO4P,QPO4P
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",0.00,3.080,1,7.600,1,8.530,1,0.000,0,0.000,0,0.
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",2.50,3.080,1,7.600,1,0.000,0,0.000,0,0.000,0,0.
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",5.00,3.070,1,7.610,1,0.000,0,0.000,0,0.000,0,0.
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",7.50,3.070,1,7.610,1,0.000,0,0.000,0,0.000,0,0.
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",10.00,3.070,1,7.600,1,8.510,1,0.000,0,0.000,0,0
```




```
SERVER_ID,ID,LATITUDE,LONGITUDE,OBSDATE,OBSTIME,SHIP,OBSDEP,TEMP,QTEMP,SALIN,QSALIN,TOTOXY,QTOT
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1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",2.50,3.080,1,7.600,1,0.000,0,0.00
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",5.00,3.070,1,7.610,1,0.000,0,0.00
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",7.50,3.070,1,7.610,1,0.000,0,0.00
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",10.00,3.070,1,7.600,1,8.510,1,0.0
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",12.50,3.070,1,7.610,1,0.000,0,0.0
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",15.00,3.070,1,7.610,1,0.000,0,0.0
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",17.50,3.070,1,7.610,1,0.000,0,0.0
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1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",25.00,3.080,1,7.610,1,0.000,0,0.0
1,200005962,55.2450,16.0000,"2000-02-25","16:10:00","Baltica",27.50,3.080,1,7.610,1,0.000,0,0.0
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```
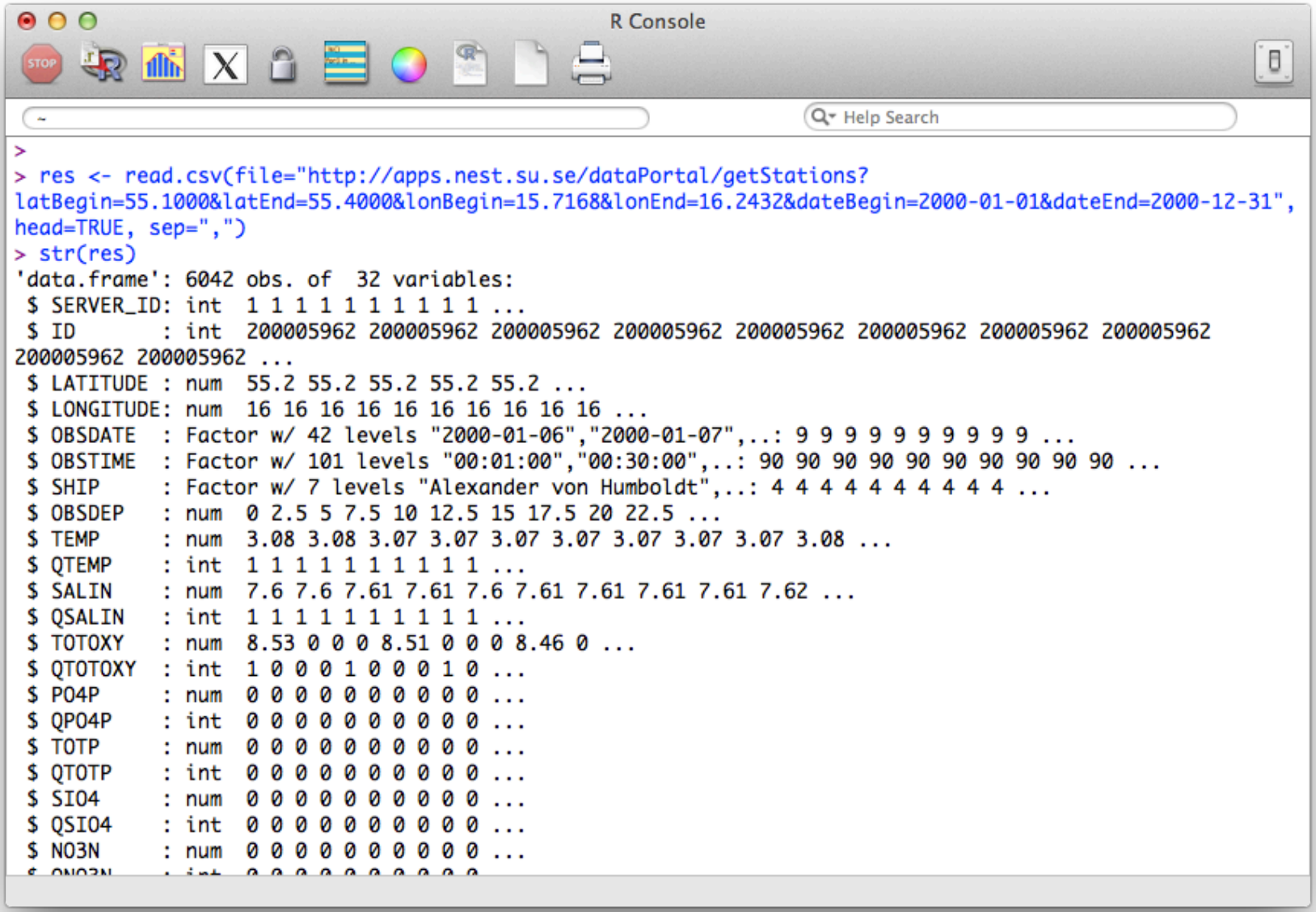
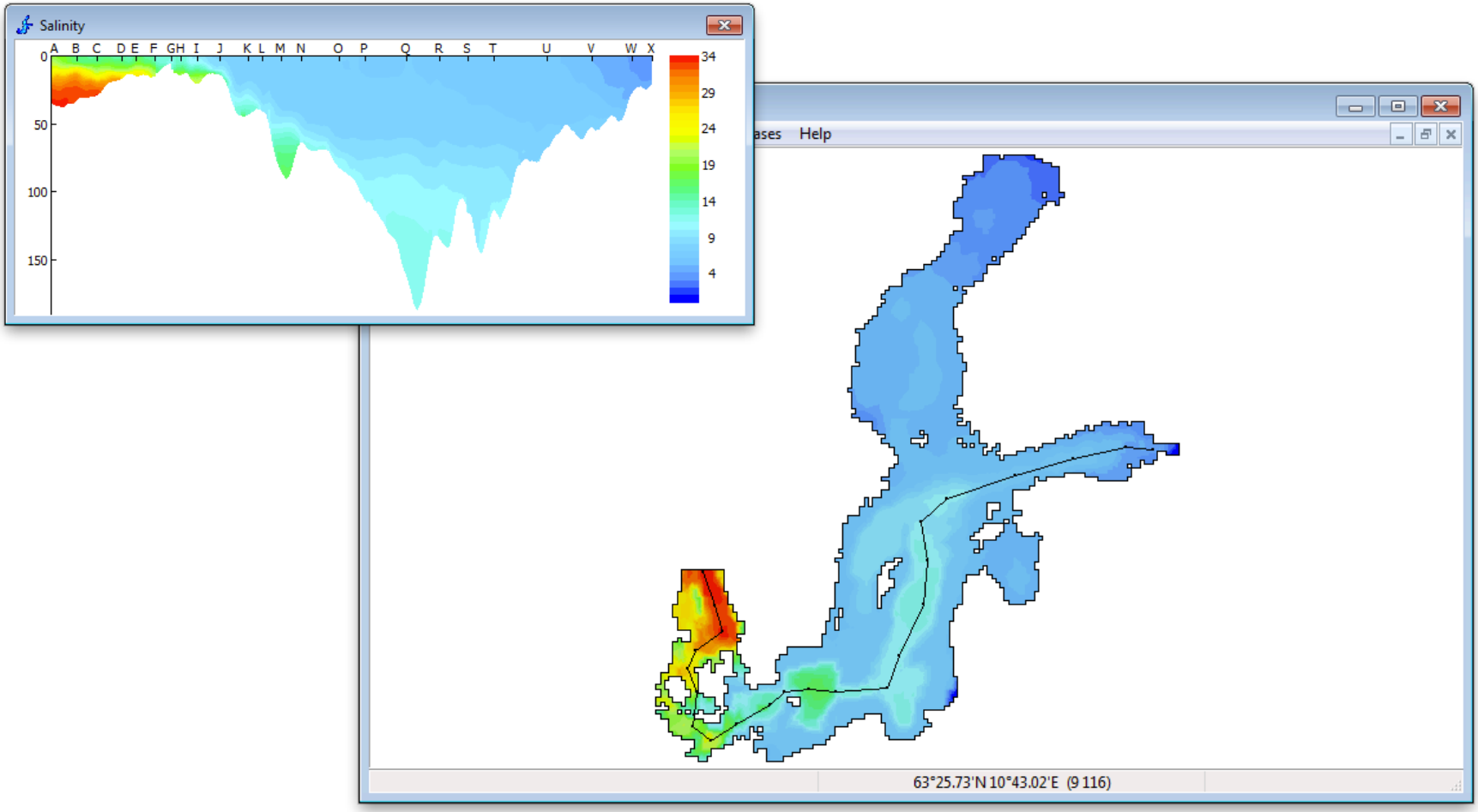
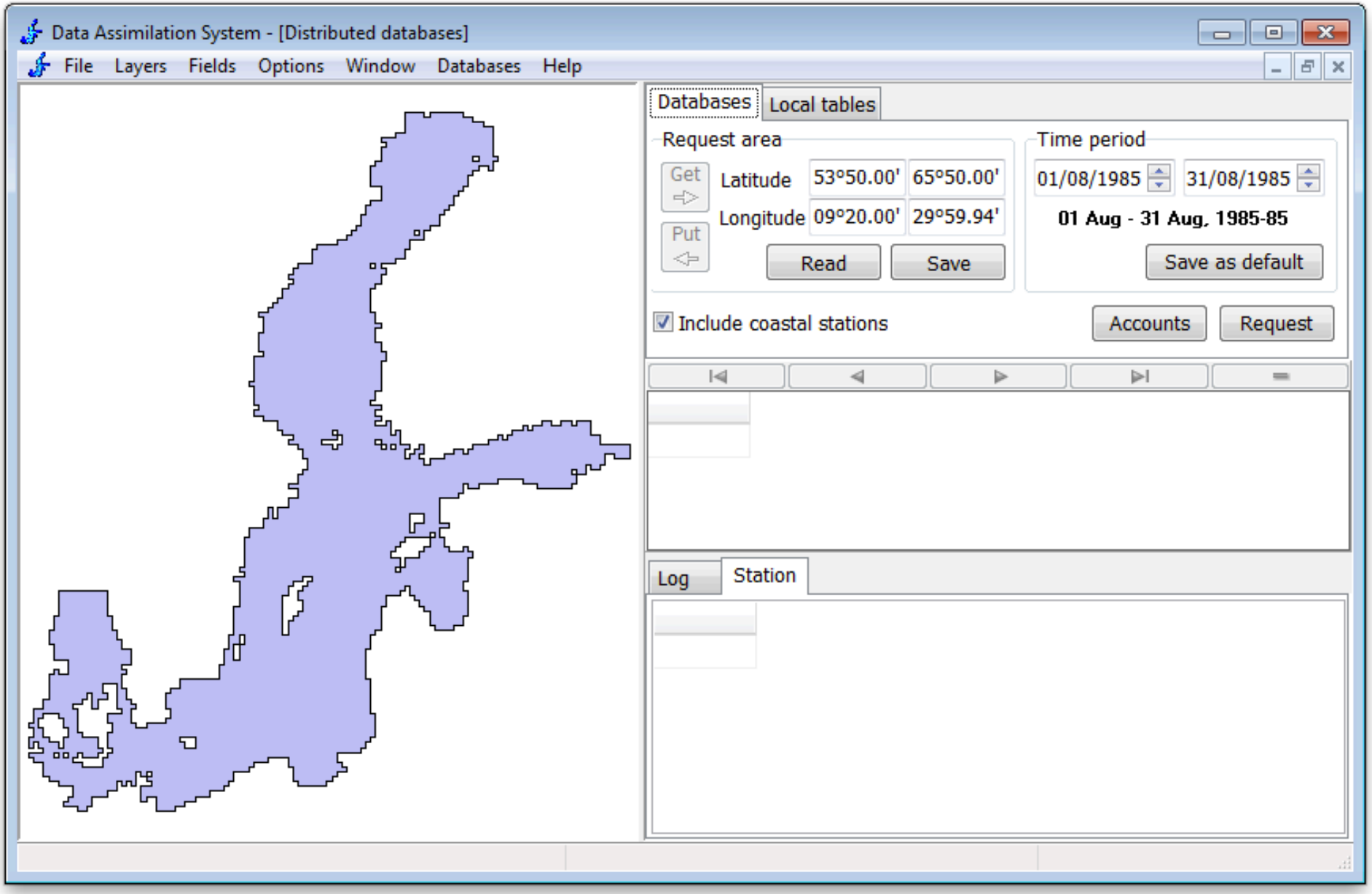



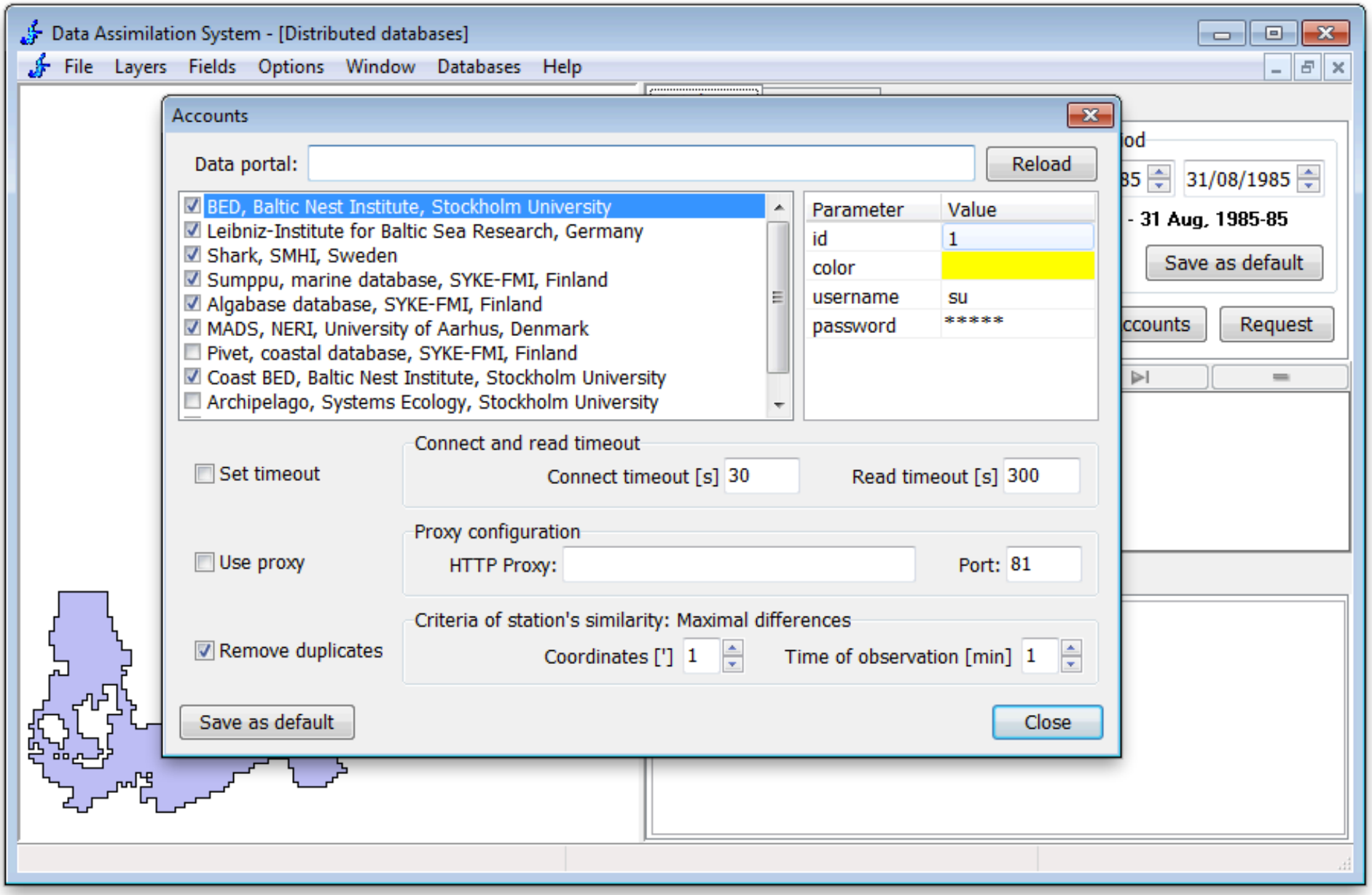
res <- read.csv(file="http://apps.nest.su.se/dataPortal/getStations?latBegin=55.1000&latEnd=55.4000&lonBegin=15.7168&lonEnd=16.2432&dateBegin=2000-01-01&dateEnd=2000-12-31", head=TRUE, sep=",")

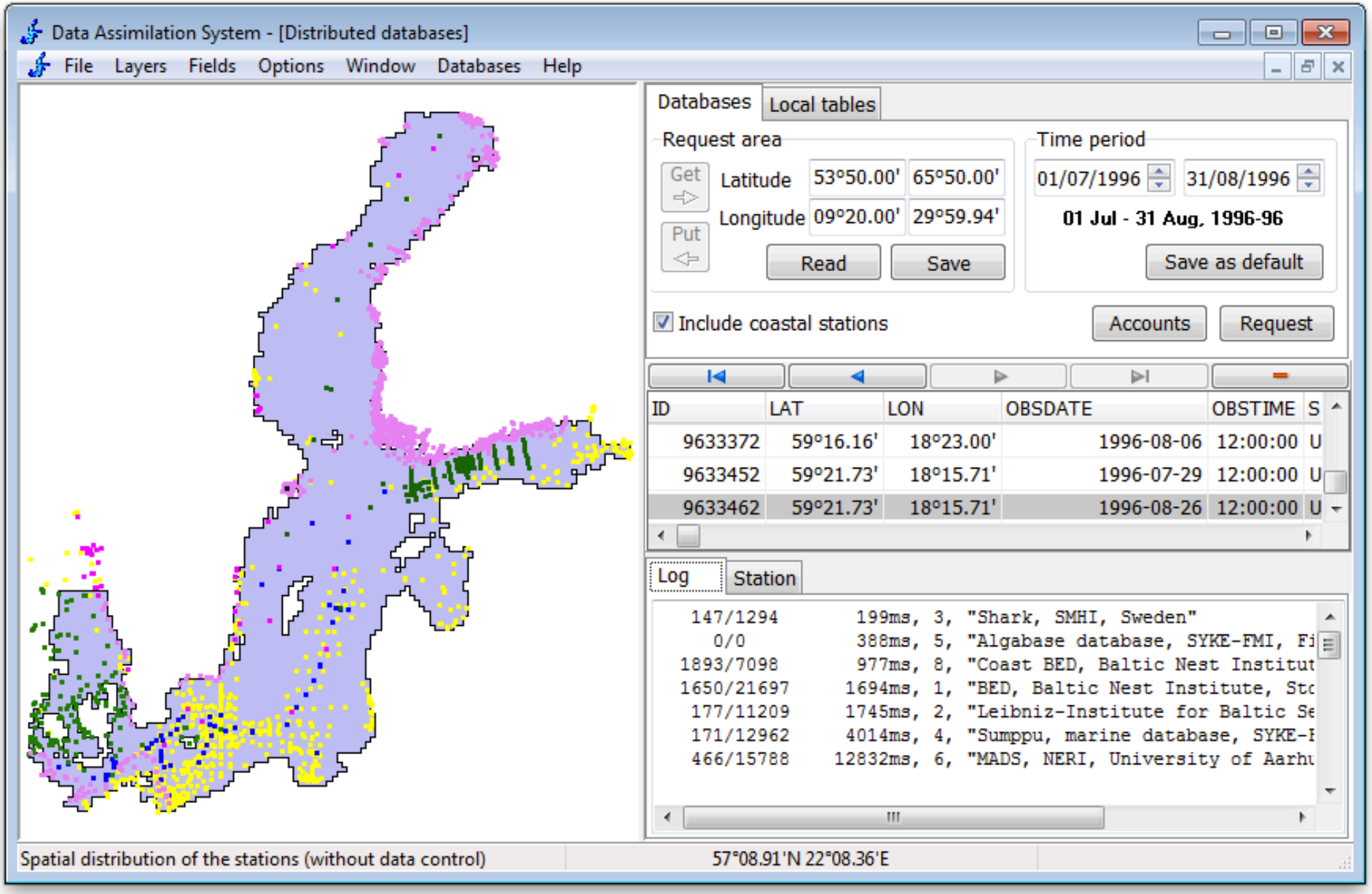
Gridded data

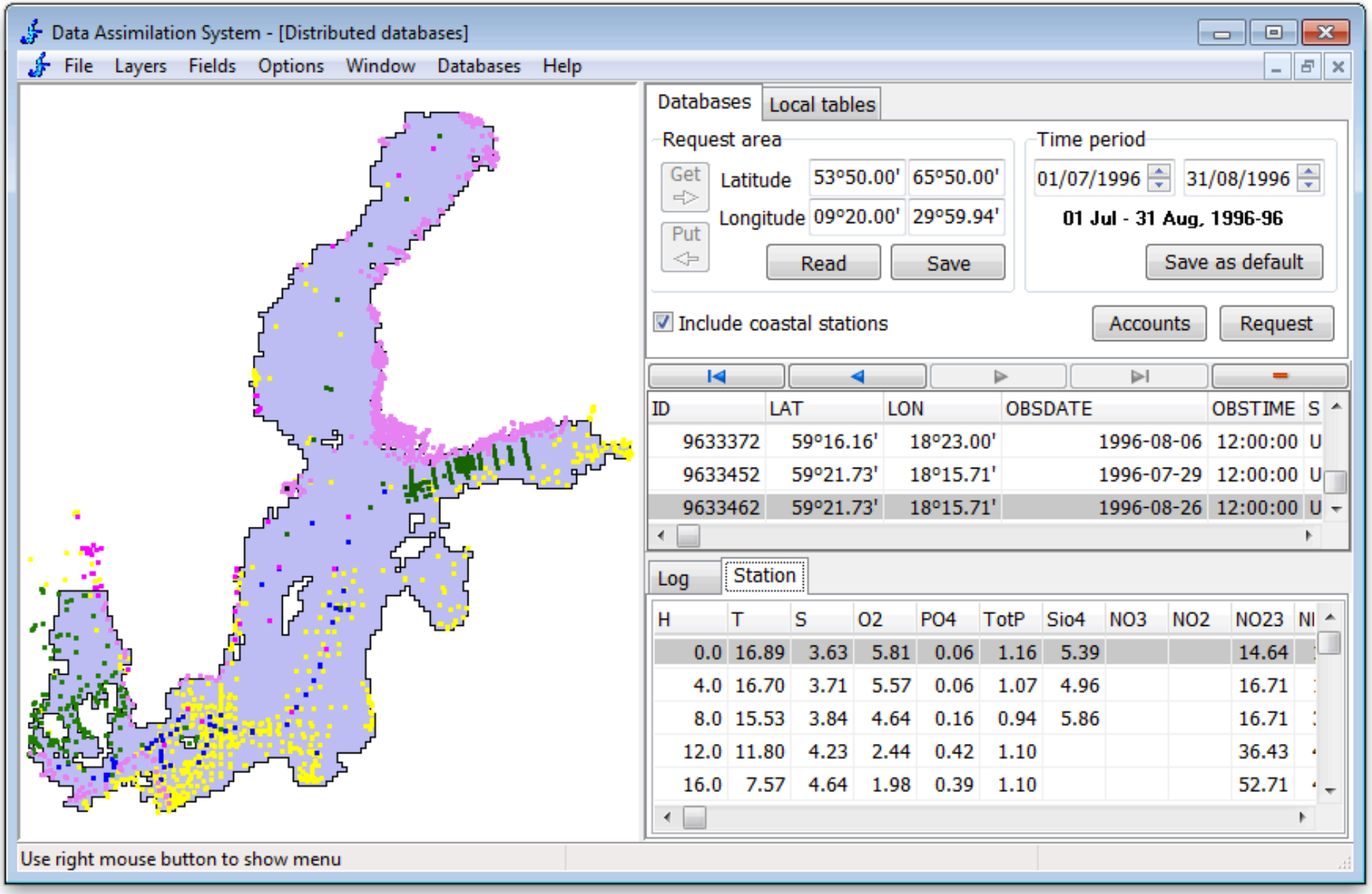


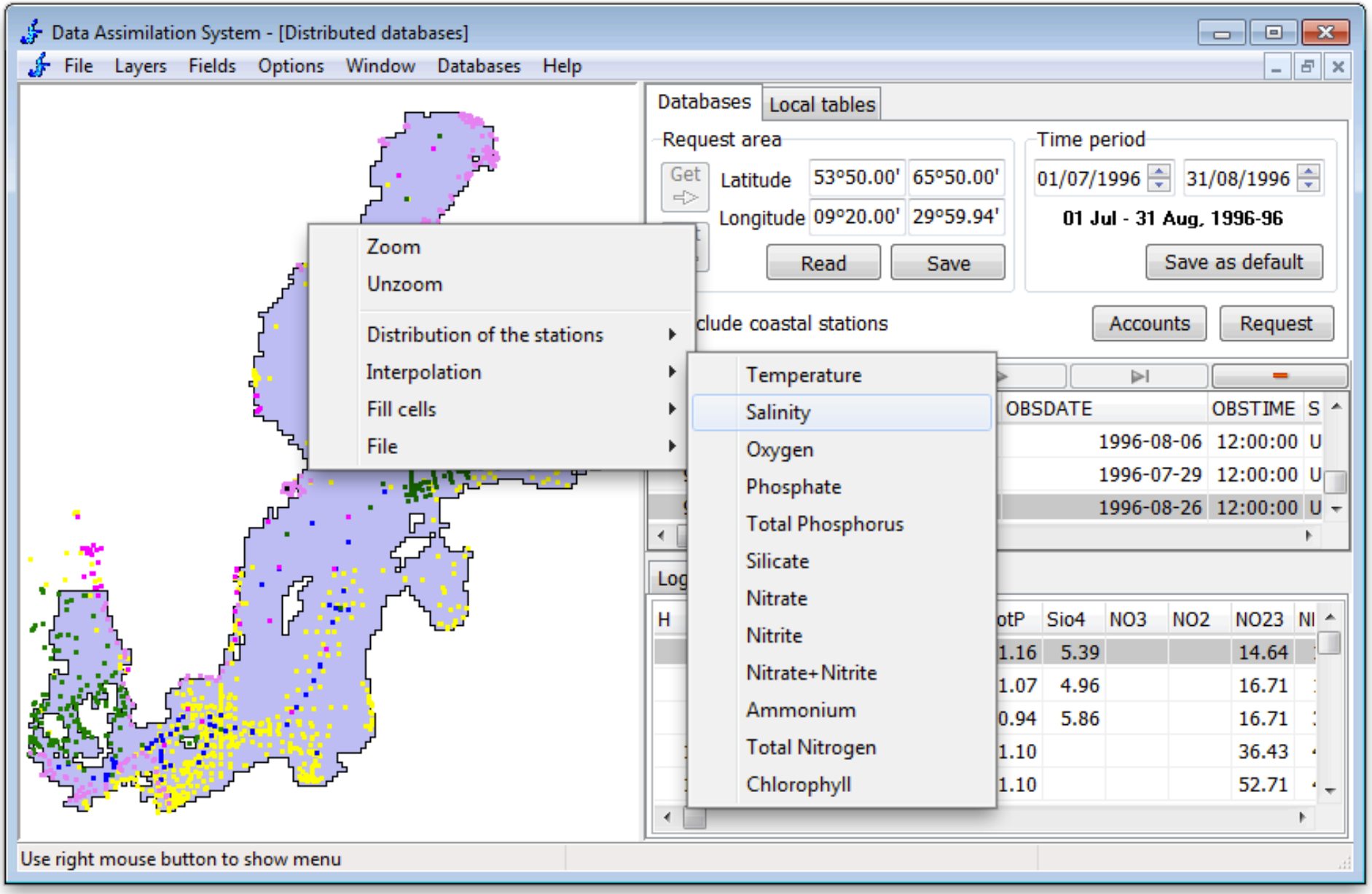
http://nest.su.se/das/

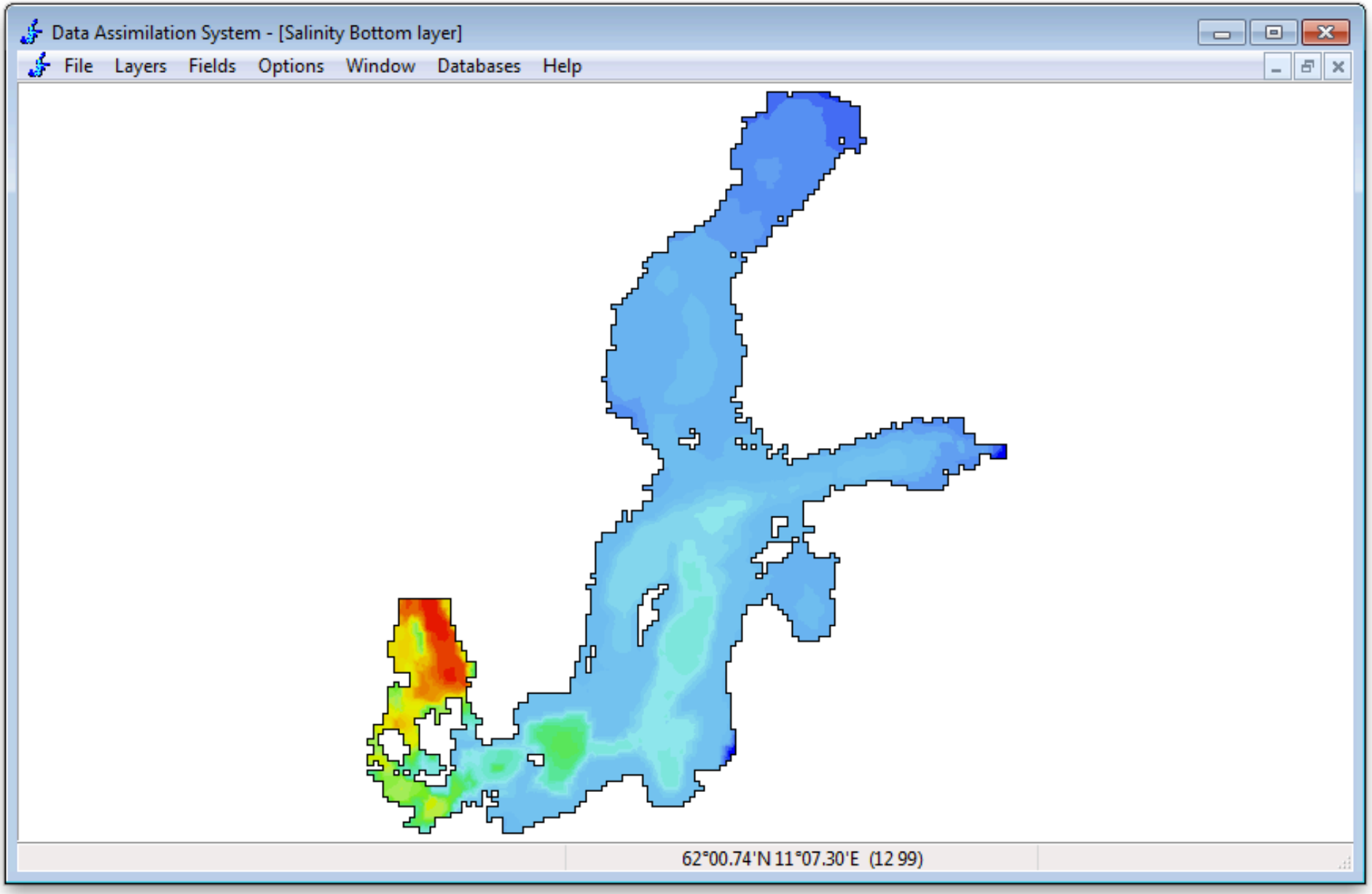

Data Assimilation System - [Distributed databases]
File
Layers
Fields
Options
Window
Databases
Help
Databases
Local tables
Request area
Get
Put
Latitude
53°50.00'
65°50.00'
Longitude
09°20.00'
29°59.94'
Read
Save
Time period
01/08/1985
31/08/1985
01 Aug - 31 Aug, 1985-85
Save as default
Include coastal stations
Accounts
Request
Log
Station

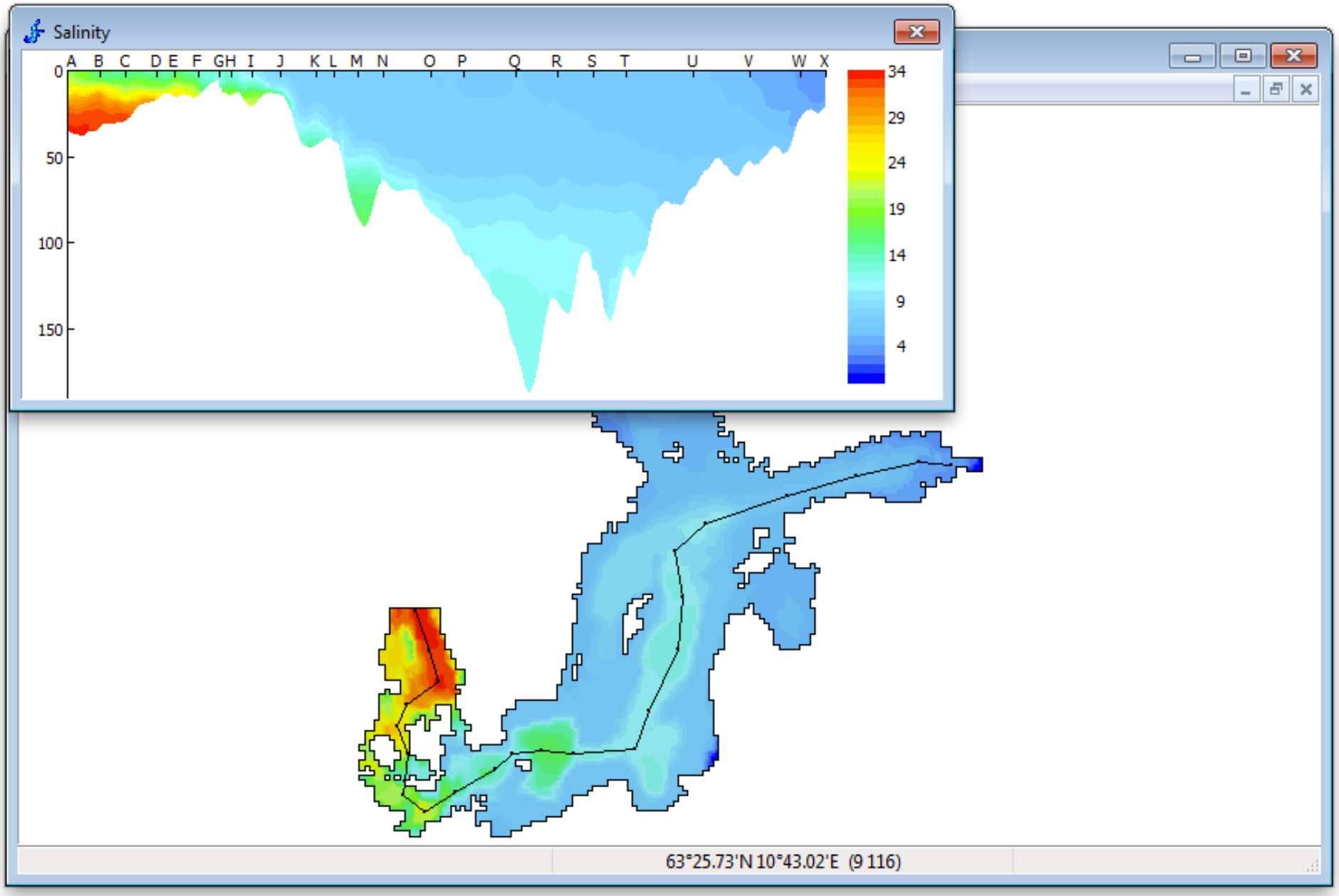

Data Assimilation System - [Distributed databases]
File
Layers
Fields
Options
Window
Databases
Help
Accounts
Data portal:
Reload
BED, Baltic Nest Institute, Stockholm University
Leibniz-Institute for Baltic Sea Research, Germany
Shark, SMHI, Sweden
Sumppu, marine database, SYKE-FMI, Finland
Algabase database, SYKE-FMI, Finland
MADS, NERI, University of Aarhus, Denmark
Pivet, coastal database, SYKE-FMI, Finland
Coast BED, Baltic Nest Institute, Stockholm University
Archipelago, Systems Ecology, Stockholm University
Parameter
Value
id
1
color
username
su
password
*****
Set timeout
Connect and read timeout
Connect timeout [s] 30
Read timeout [s] 300
Use proxy
Proxy configuration
HTTP Proxy:
Port: 81
Remove duplicates
Criteria of station's similarity: Maximal differences
Coordinates ['] 1
Time of observation [min] 1
Save as default
Close
31/08/1985
- 31 Aug, 1985-85
Save as default
Request


Data Assimilation System - [Distributed databases]
File Layers Fields Options Window Databases Help
Databases Local tables
Request area
Get
Put
Latitude 53°50.00' 65°50.00'
Longitude 09°20.00' 29°59.94'
Read Save
Time period
01/07/1996 31/08/1996
01 Jul - 31 Aug, 1996-96
Save as default
Include coastal stations
Accounts Request
ID LAT LON OBSDATE OBSTIME S
9633372 59°16.16' 18°23.00' 1996-08-06 12:00:00 U
9633452 59°21.73' 18°15.71' 1996-07-29 12:00:00 U
9633462 59°21.73' 18°15.71' 1996-08-26 12:00:00 U
Log Station
147/1294 199ms, 3, "Shark, SMHI, Sweden"
0/0 388ms, 5, "Algabase database, SYKE-FMI, Fi
1893/7098 977ms, 8, "Coast BED, Baltic Nest Institut
1650/21697 1694ms, 1, "BED, Baltic Nest Institute, Sto
177/11209 1745ms, 2, "Leibniz-Institute for Baltic Se
171/12962 4014ms, 4, "Sumppu, marine database, SYKE-F
466/15788 12832ms, 6, "MADS, NERI, University of Aarhu
Spatial distribution of the stations (without data control)
57°08.91'N 22°08.36'E

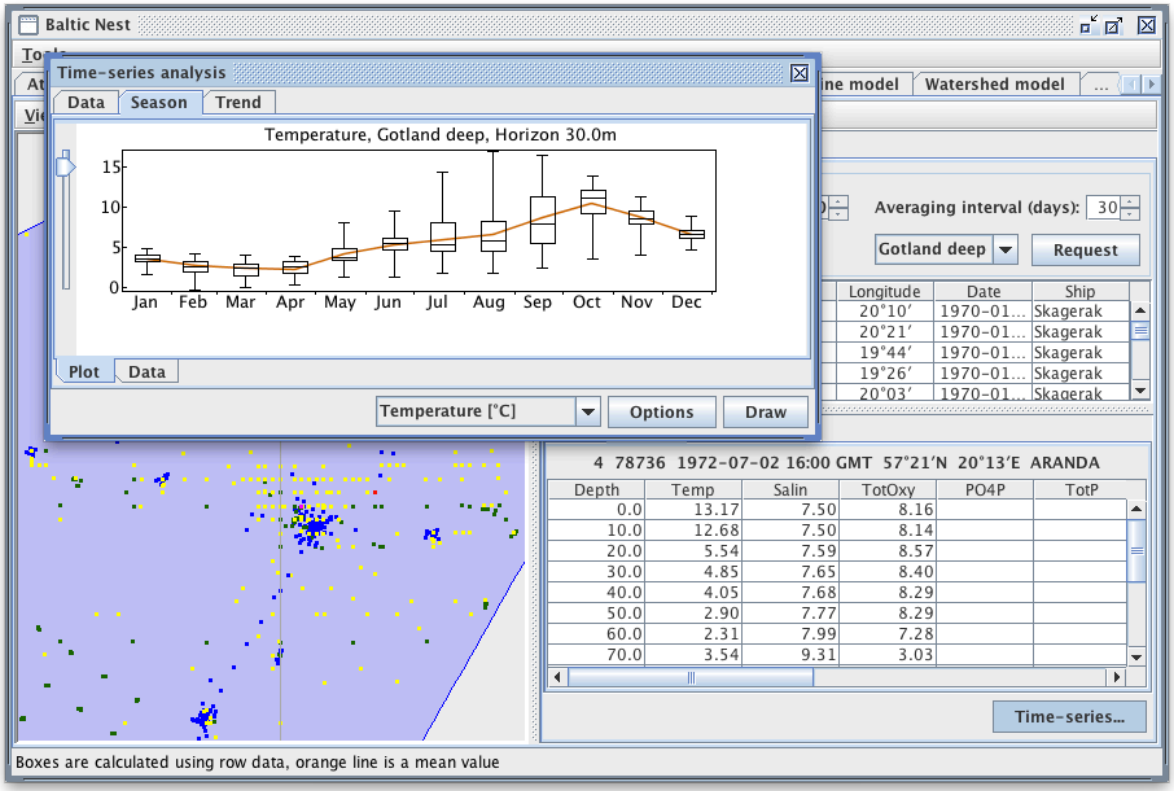

Data Assimilation System - [Distributed databases]
File
Layers
Fields
Options
Window
Databases
Help
Databases
Local tables
Request area
Get
Put
Latitude
53°50.00'
65°50.00'
Longitude
09°20.00'
29°59.94'
Read
Save
Time period
01/07/1996
31/08/1996
01 Jul - 31 Aug, 1996-96
Save as default
Include coastal stations
Accounts
Request
ID
LAT
LON
OBSDATE
OBSTIME
S
9633372
59°16.16'
18°23.00'
1996-08-06
12:00:00
U
9633452
59°21.73'
18°15.71'
1996-07-29
12:00:00
U
9633462
59°21.73'
18°15.71'
1996-08-26
12:00:00
U
Log
Station
H
T
S
O2
PO4
TotP
Sio4
NO3
NO2
NO23
NI
0.0
16.89
3.63
5.81
0.06
1.16
5.39
14.64
4.0
16.70
3.71
5.57
0.06
1.07
4.96
16.71
8.0
15.53
3.84
4.64
0.16
0.94
5.86
16.71
12.0
11.80
4.23
2.44
0.42
1.10
36.43
16.0
7.57
4.64
1.98
0.39
1.10
52.71
Use right mouse button to show menu


Data Assimilation System - [Distributed databases]
File
Layers
Fields
Options
Window
Databases
Help
Databases
Local tables
Request area
Get
Latitude
53°50.00'
65°50.00'
Longitude
09°20.00'
29°59.94'
Read
Save
Time period
01/07/1996
31/08/1996
01 Jul - 31 Aug, 1996-96
Save as default
clude coastal stations
Accounts
Request
Zoom
Unzoom
Distribution of the stations
Interpolation
Fill cells
File
Temperature
Salinity
Oxygen
Phosphate
Total Phosphorus
Silicate
Nitrate
Nitrite
Nitrate+Nitrite
Ammonium
Total Nitrogen
Chlorophyll
OBSDATE
OBSTIME
1996-08-06
12:00:00
1996-07-29
12:00:00
1996-08-26
12:00:00
Sio4
NO3
NO2
NO23
14.64
16.71
16.71
36.43
52.71
Use right mouse button to show menu

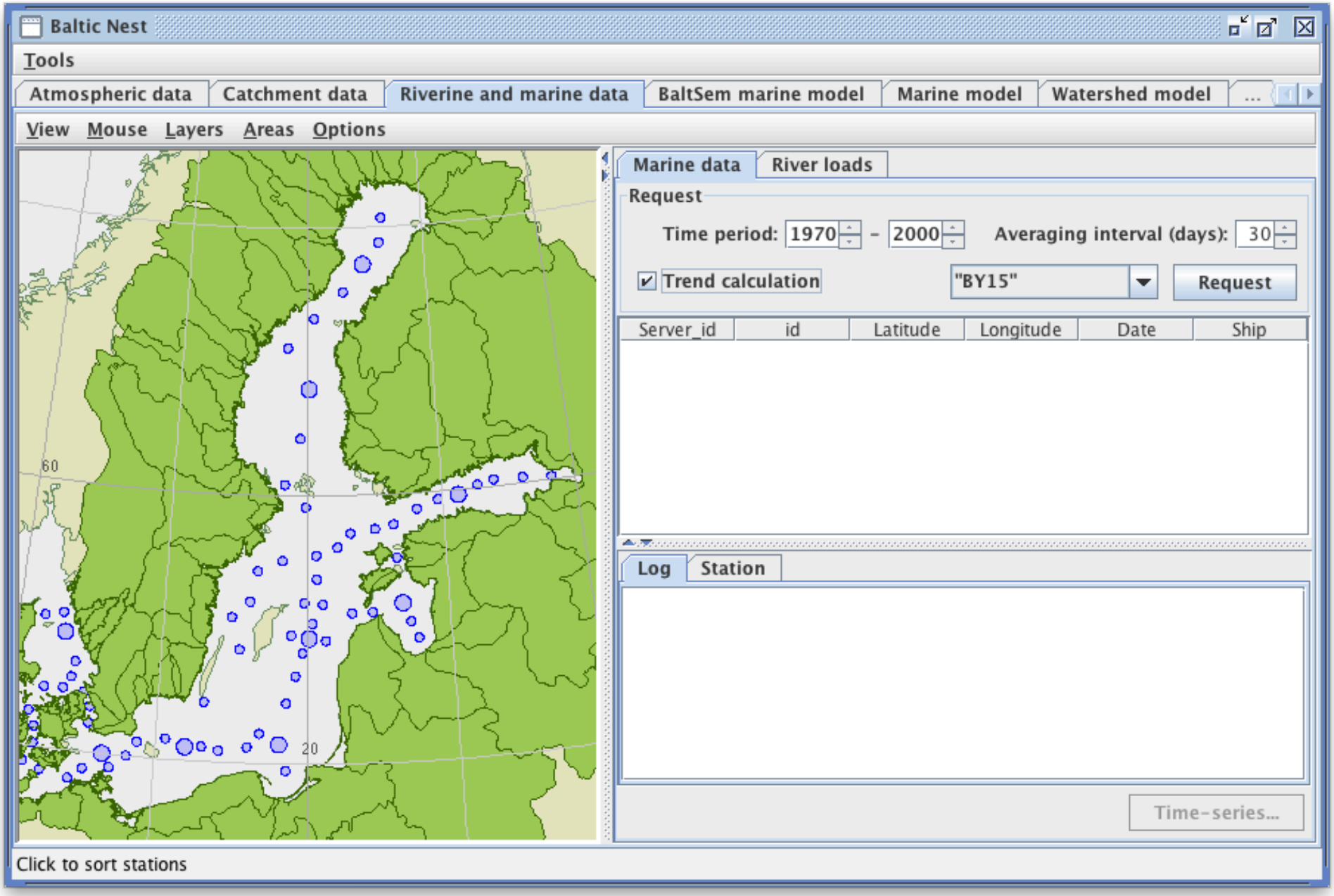

Data Assimilation System - [Salinity Bottom layer]
File
Layers
Fields
Options
Window
Databases
Help
62°00.74'N 11°07.30'E (12 99)

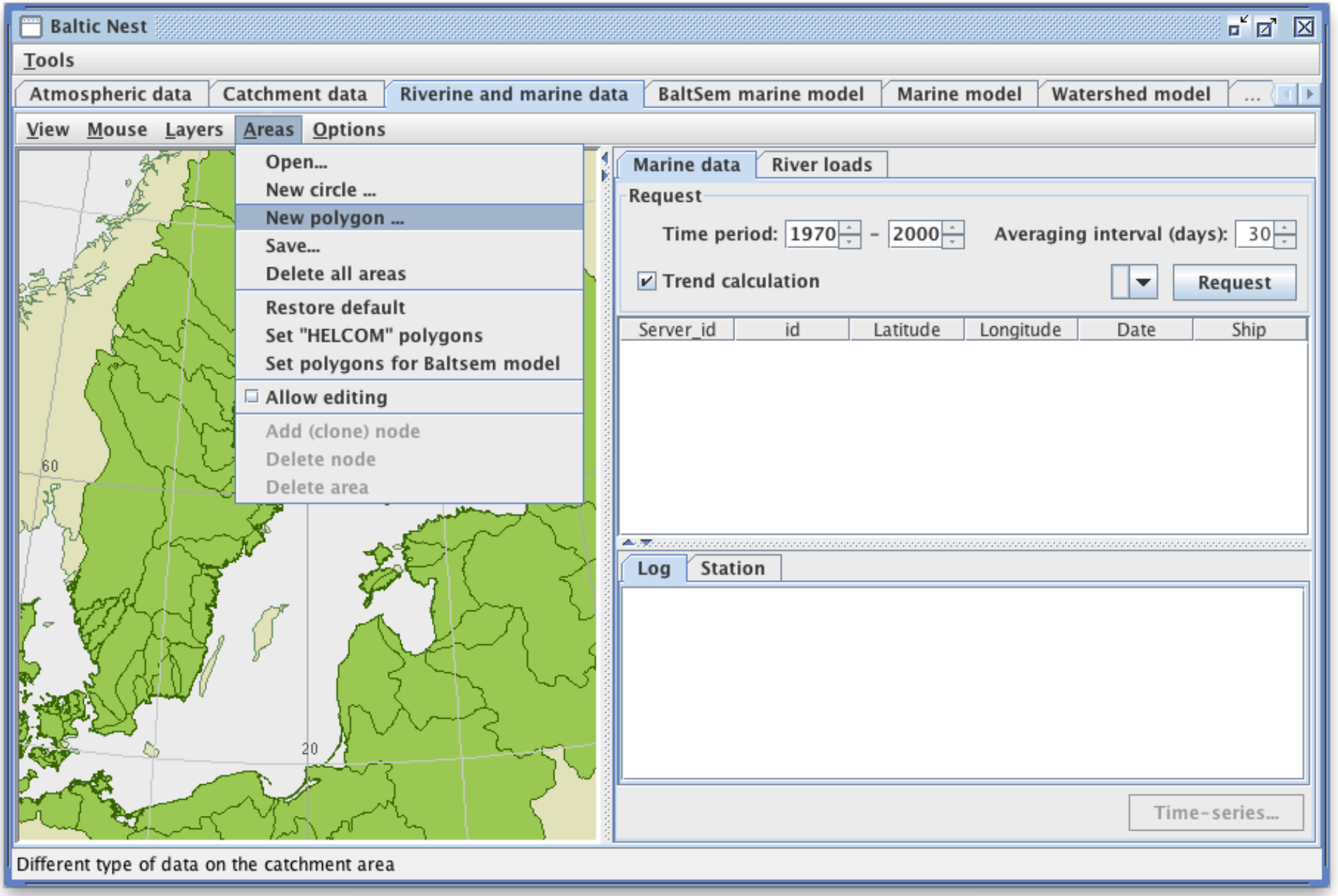

Salinity
A B C D E F GH I J K L M N O P Q R S T U V W X
0
50
100
150
34
29
24
19
14
9
4
63°25.73'N 10°43.02'E (9 116)

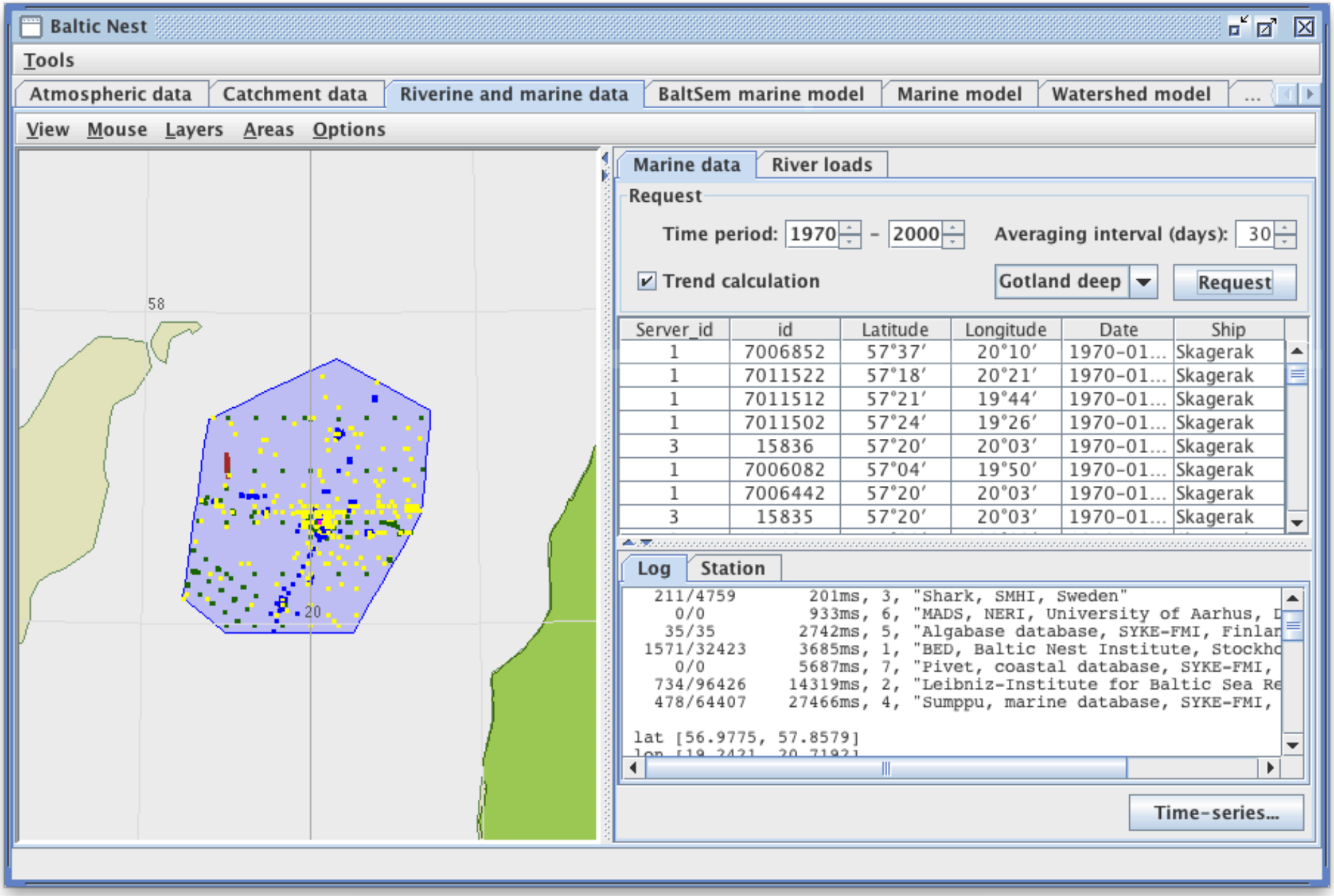
Time series

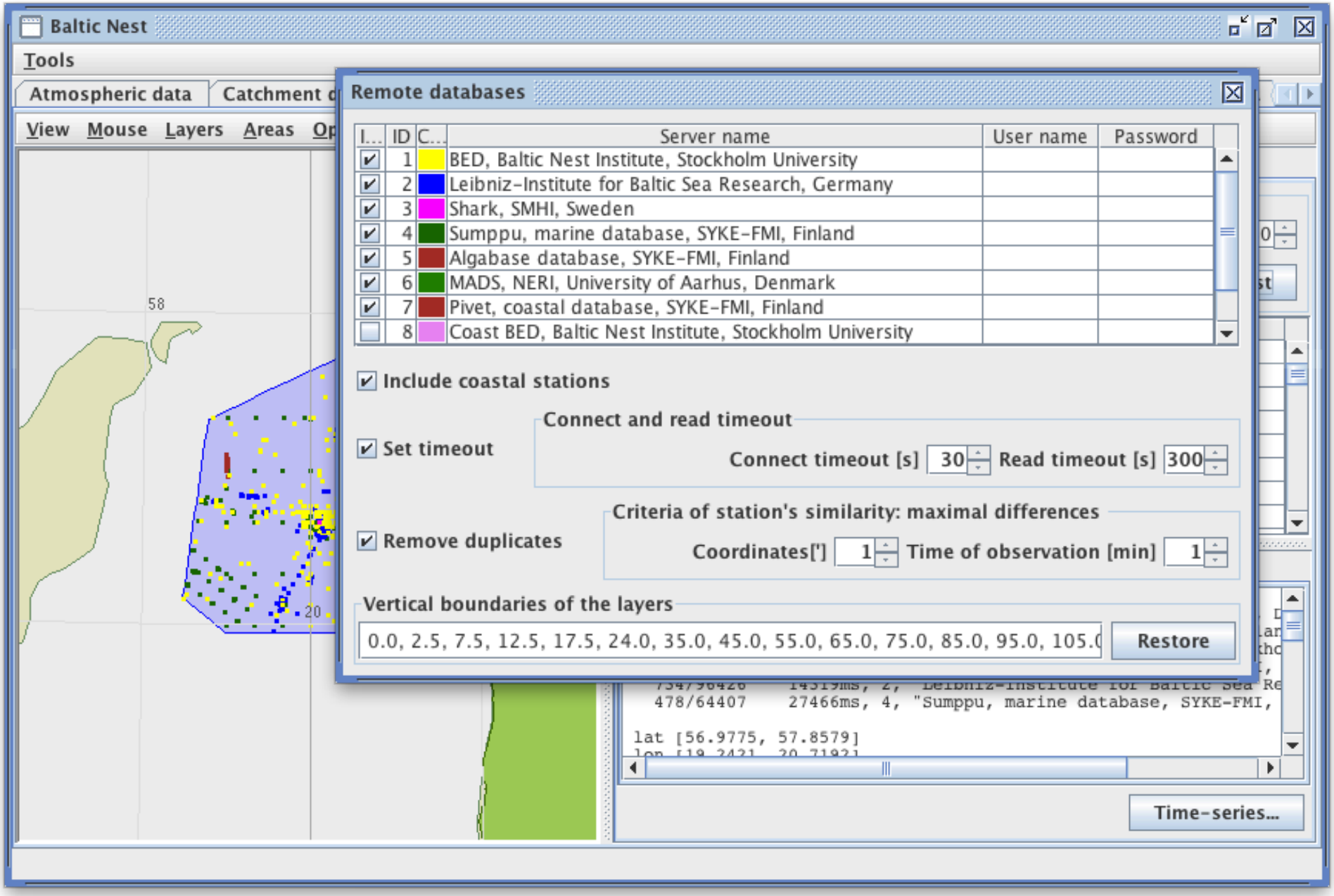


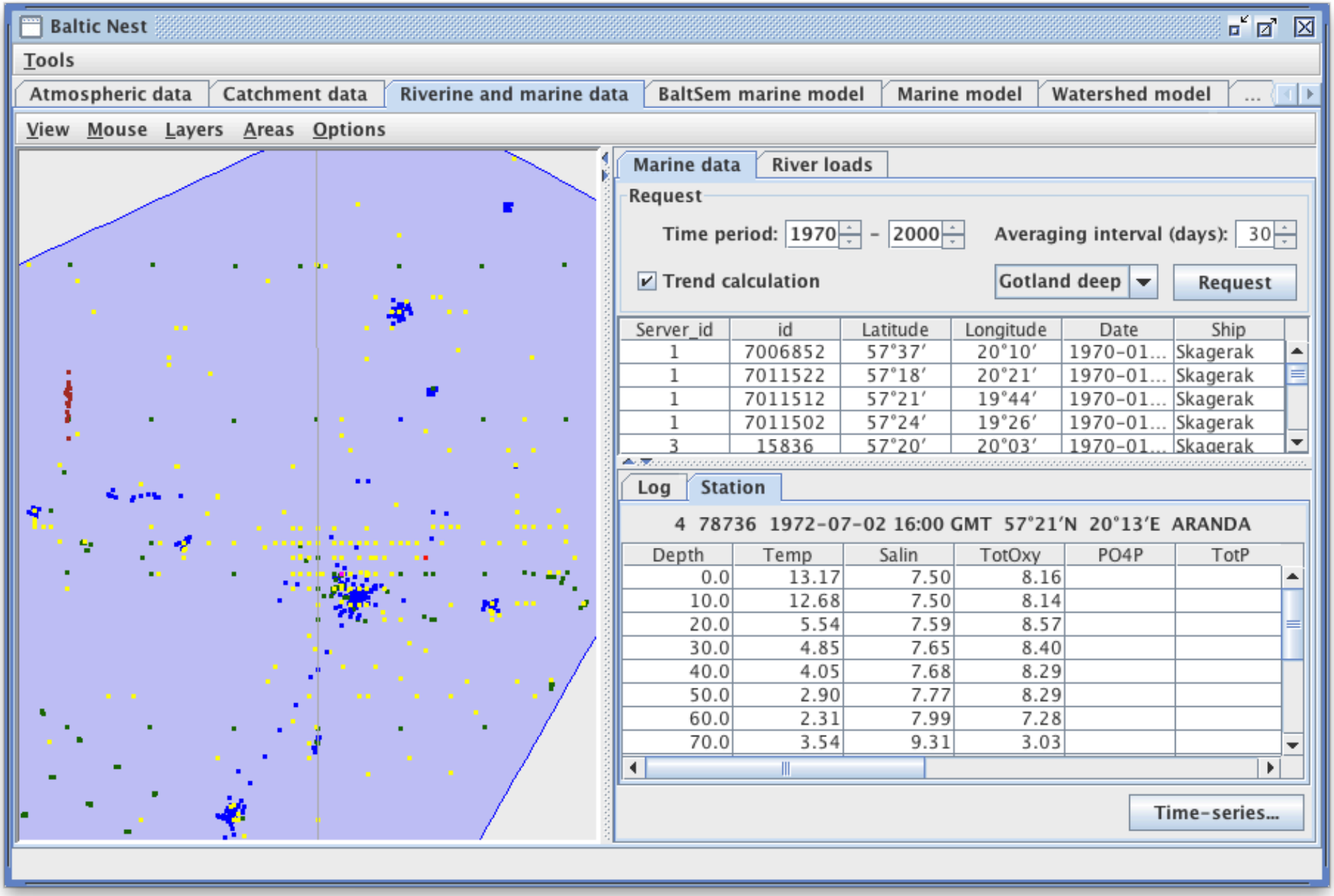
http://nest.su.se/

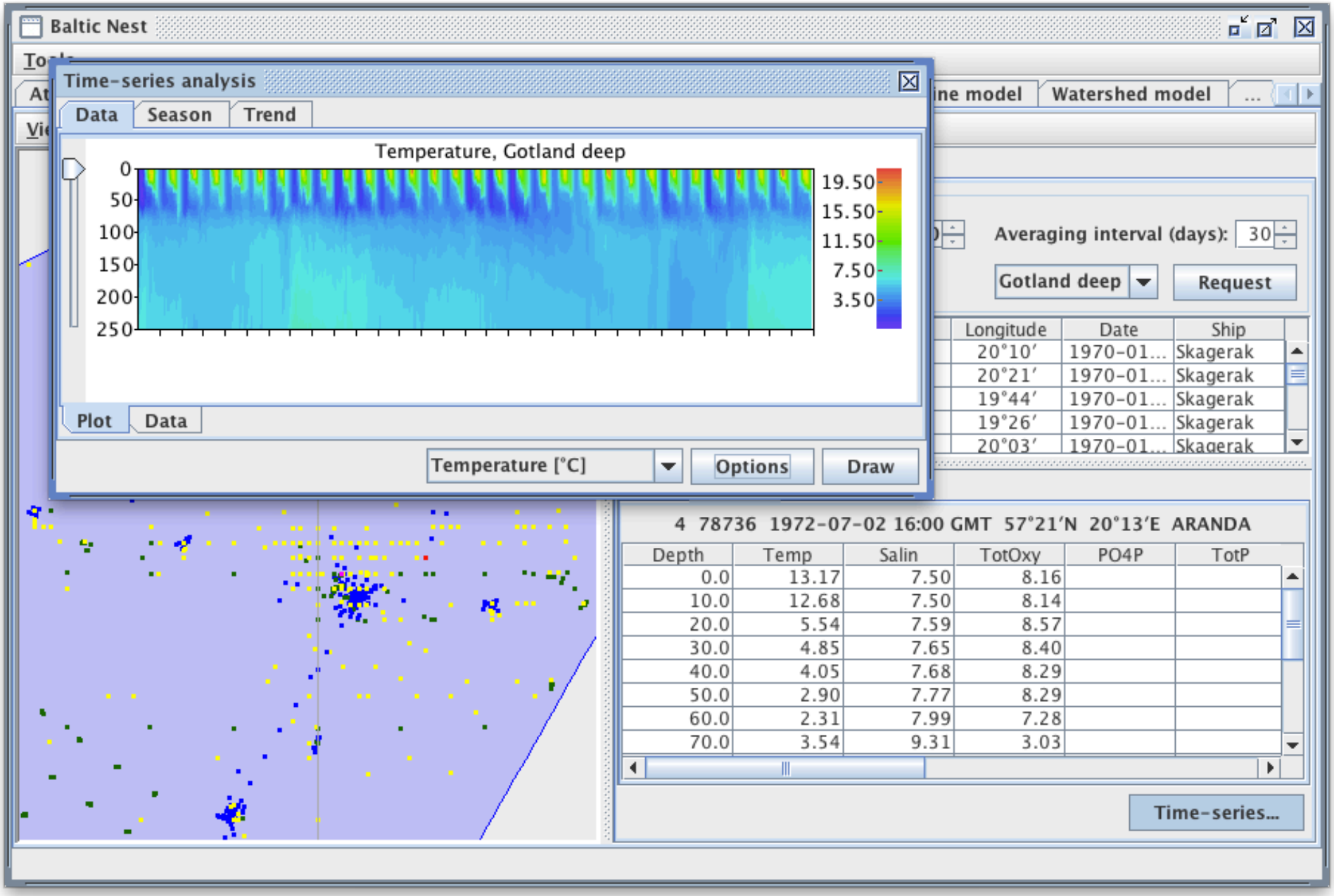

Baltic Nest
Tools
Atmospheric data
Catchment data
Riverine and marine data
BaltSem marine model
Marine model
Watershed model
...
View
Mouse
Layers
Areas
Options
60
20
Marine data
River loads
Request
Time period:
1970
-
2000
Averaging interval (days):
30
Trend calculation
"BY15"
Request
Server_id
id
Latitude
Longitude
Date
Ship
Log
Station
Time-series...
Click to sort stations

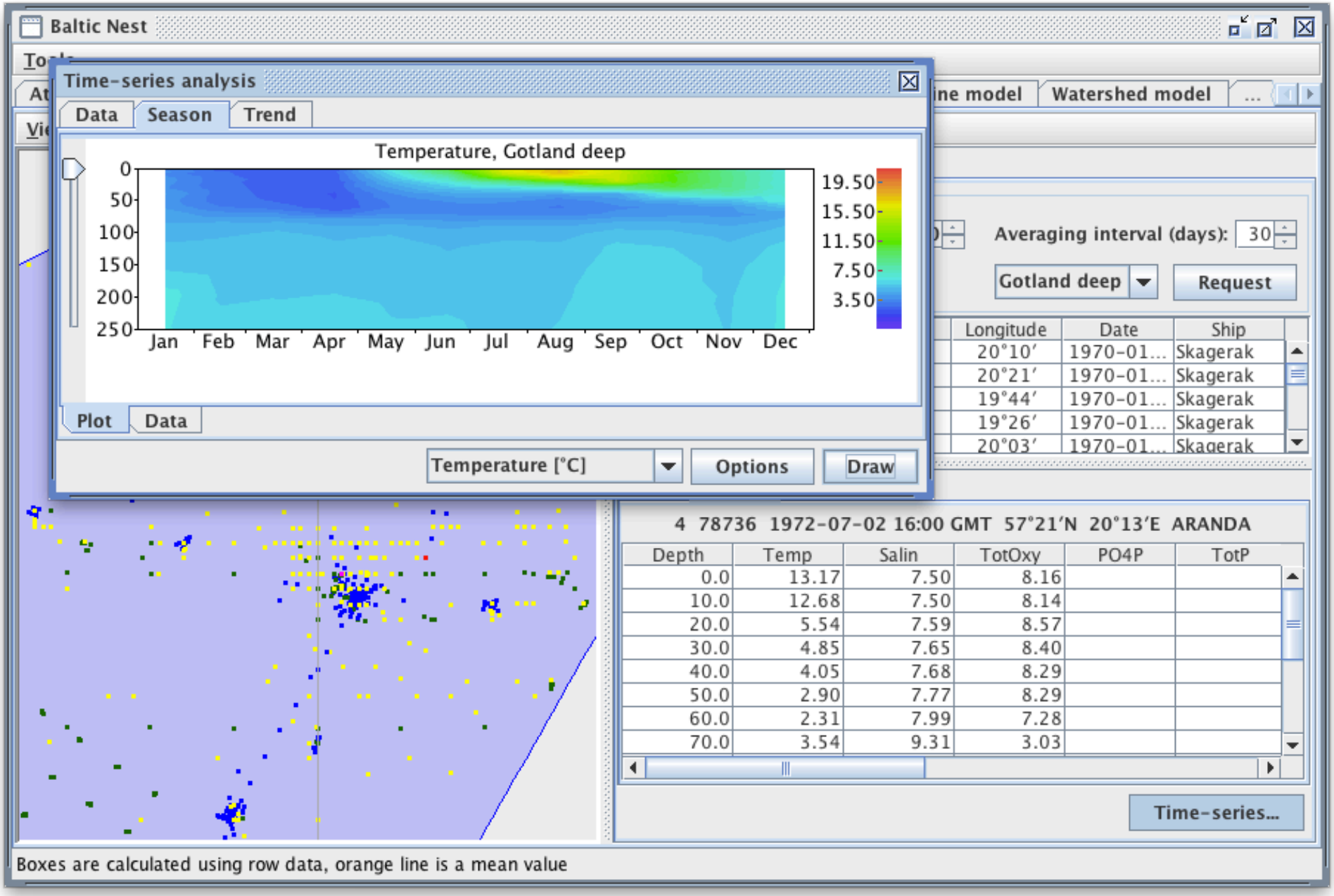

Baltic Nest
Tools
Atmospheric data
Catchment data
Riverine and marine data
BaltSem marine model
Marine model
Watershed model
...
View
Mouse
Layers
Areas
Options
Open...
New circle ...
New polygon ...
Save...
Delete all areas
Restore default
Set "HELCOM" polygons
Set polygons for Baltsem model
Allow editing
Add (clone) node
Delete node
Delete area
60
20
Marine data
River loads
Request
Time period:
1970
-
2000
Averaging interval (days):
30
Trend calculation
Request
Server_id
id
Latitude
Longitude
Date
Ship
Log
Station
Time-series...
Different type of data on the catchment area

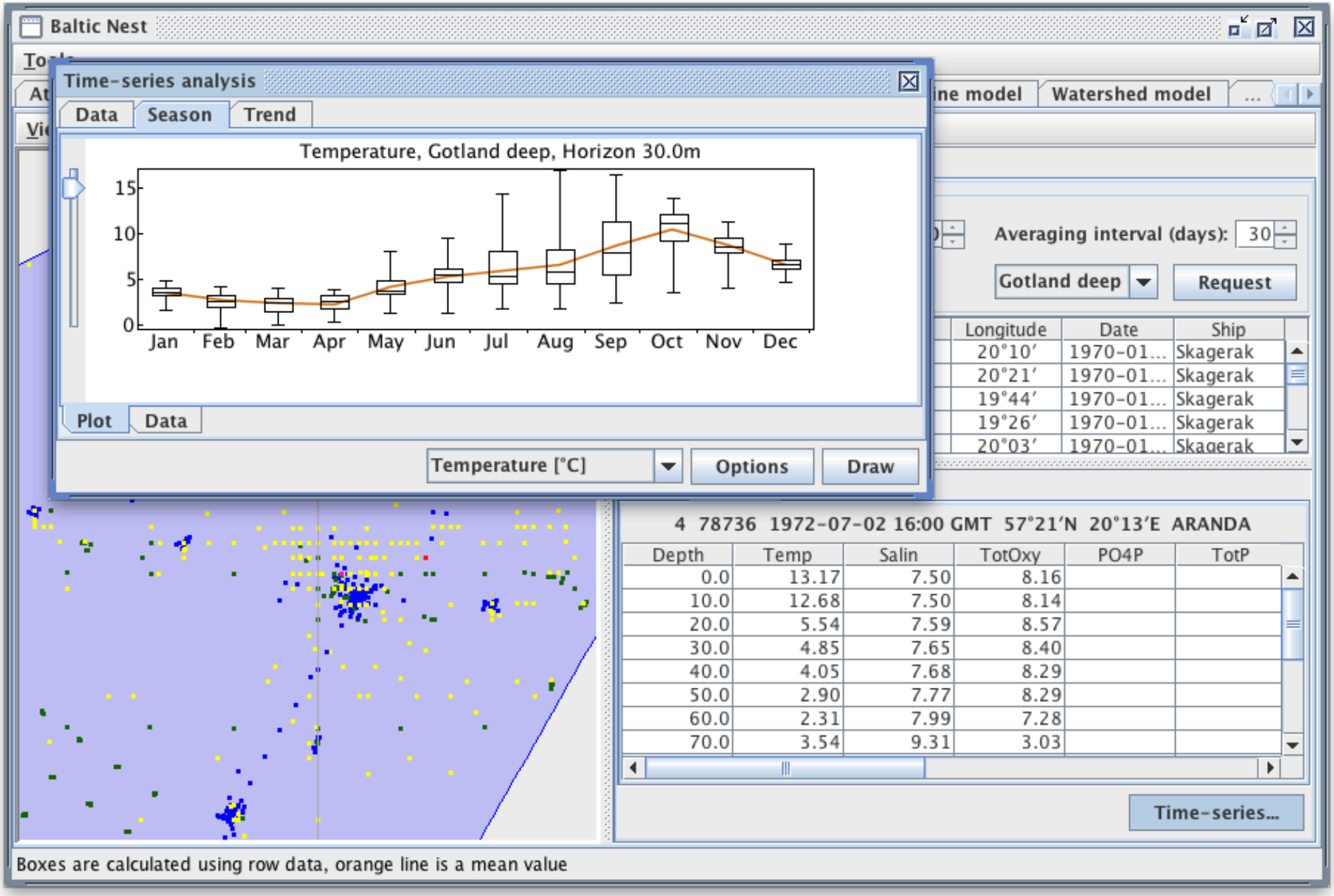

Baltic Nest
Tools
Atmospheric data
Catchment data
Riverine and marine data
BaltSem marine model
Marine model
Watershed model
...
View
Mouse
Layers
Areas
Options
58
20
Marine data
River loads
Request
Time period:
1970
-
2000
Averaging interval (days):
30
Trend calculation
Gotland deep
Request
Server_id
id
Latitude
Longitude
Date
Ship
1 7006852 57°37′ 20°10′ 1970-01... Skagerak
1 7011522 57°18′ 20°21′ 1970-01... Skagerak
1 7011512 57°21′ 19°44′ 1970-01... Skagerak
1 7011502 57°24′ 19°26′ 1970-01... Skagerak
3 15836 57°20′ 20°03′ 1970-01... Skagerak
1 7006082 57°04′ 19°50′ 1970-01... Skagerak
1 7006442 57°20′ 20°03′ 1970-01... Skagerak
3 15835 57°20′ 20°03′ 1970-01... Skagerak
Log
Station
211/4759 201ms, 3, "Shark, SMHI, Sweden"
0/0 933ms, 6, "MADS, NERI, University of Aarhus, D
35/35 2742ms, 5, "Algabase database, SYKE-FMI, Finlan
1571/32423 3685ms, 1, "BED, Baltic Nest Institute, Stockho
0/0 5687ms, 7, "Pivet, coastal database, SYKE-FMI,
734/96426 14319ms, 2, "Leibniz-Institute for Baltic Sea Re
478/64407 27466ms, 4, "Sumppu, marine database, SYKE-FMI,
lat [56.9775, 57.8579]
Time-series...

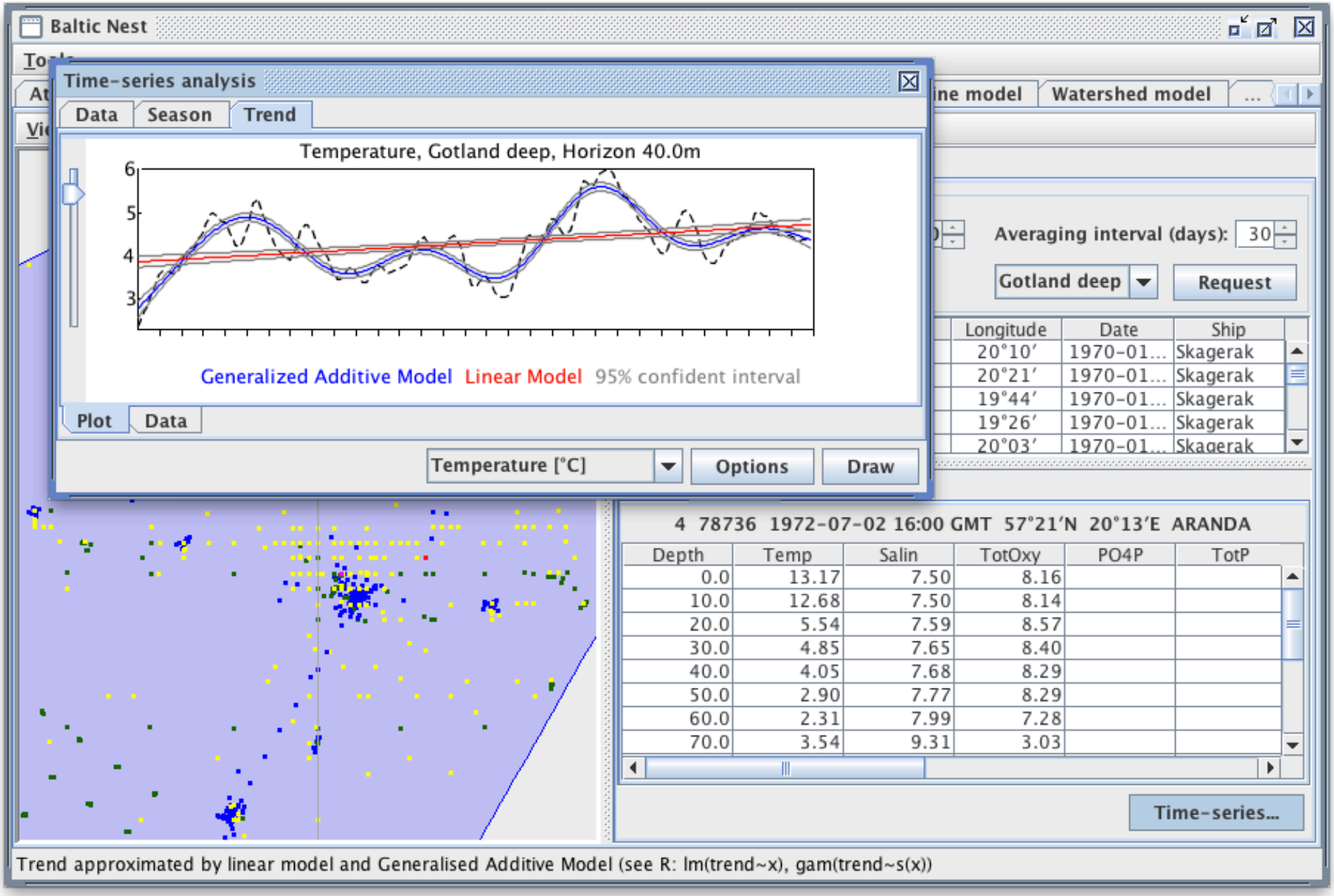

Baltic Nest
Tools
Atmospheric data
Catchment d
View
Mouse
Layers
Areas
Op
58
20
Remote databases
I...
ID
C...
Server name
User name
Password
1 BED, Baltic Nest Institute, Stockholm University
2 Leibniz-Institute for Baltic Sea Research, Germany
3 Shark, SMHI, Sweden
4 Sumppu, marine database, SYKE-FMI, Finland
5 Algabase database, SYKE-FMI, Finland
6 MADS, NERI, University of Aarhus, Denmark
7 Pivet, coastal database, SYKE-FMI, Finland
8 Coast BED, Baltic Nest Institute, Stockholm University
Include coastal stations
Set timeout
Connect and read timeout
Connect timeout [s] 30
Read timeout [s] 300
Remove duplicates
Criteria of station's similarity: maximal differences
Coordinates['] 1
Time of observation [min] 1
Vertical boundaries of the layers
0.0, 2.5, 7.5, 12.5, 17.5, 24.0, 35.0, 45.0, 55.0, 65.0, 75.0, 85.0, 95.0, 105.0
Restore
478/64407 27466ms, 4, "Sumppu, marine database, SYKE-FMI,
lat [56.9775, 57.8579]
Time-series...

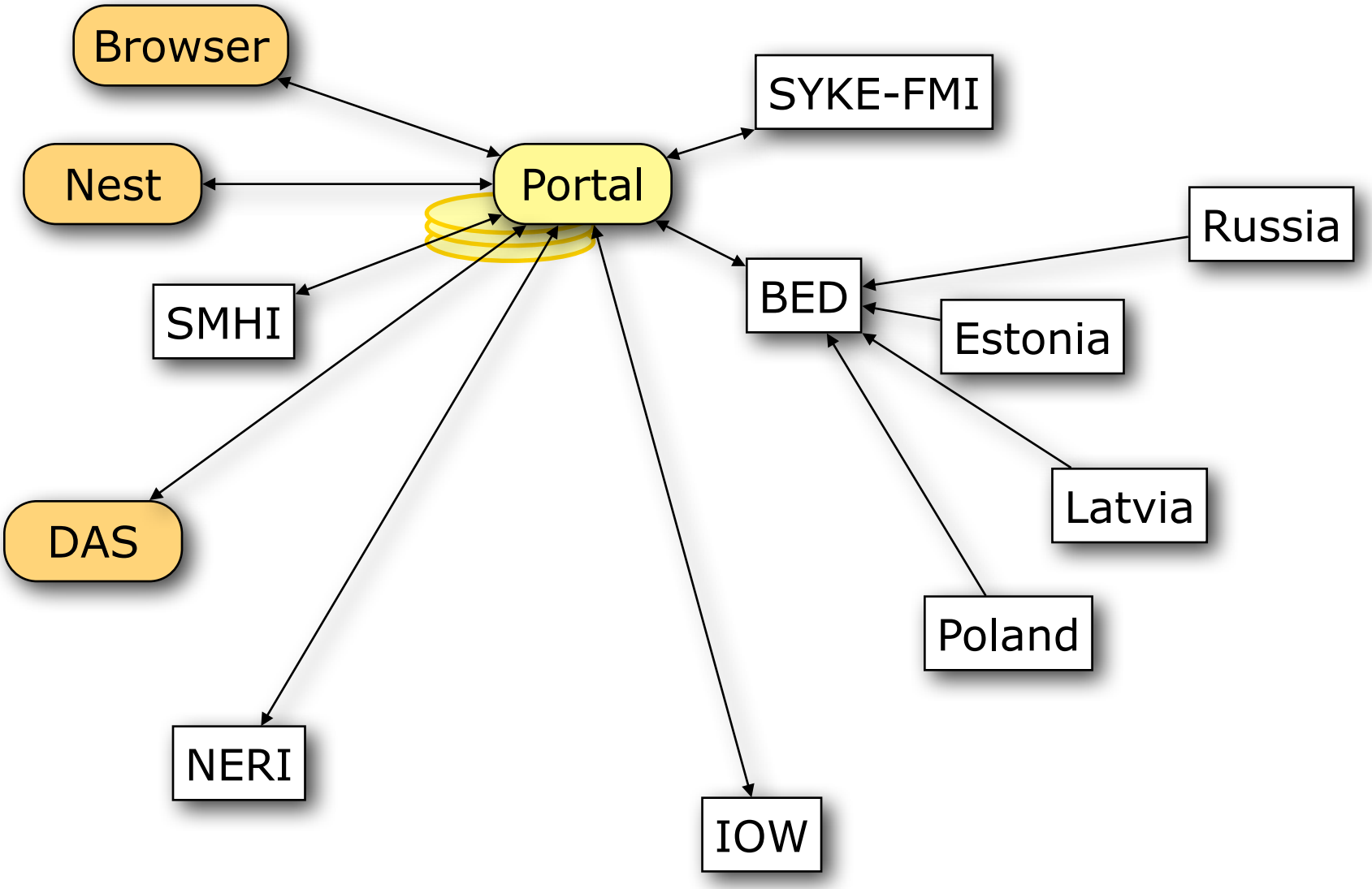

Baltic Nest
Tools
Atmospheric data
Catchment data
Riverine and marine data
BaltSem marine model
Marine model
Watershed model
...
View
Mouse
Layers
Areas
Options
Marine data
River loads
Request
Time period:
1970
-
2000
Averaging interval (days):
30
Trend calculation
Gotland deep
Request
Server_id
id
Latitude
Longitude
Date
Ship
1
7006852
57°37′
20°10′
1970-01...
Skagerak
1
7011522
57°18′
20°21′
1970-01...
Skagerak
1
7011512
57°21′
19°44′
1970-01...
Skagerak
1
7011502
57°24′
19°26′
1970-01...
Skagerak
3
15836
57°20′
20°03′
1970-01...
Skagerak
Log
Station
4 78736 1972-07-02 16:00 GMT 57°21′N 20°13′E ARANDA
Depth
Temp
Salin
TotOxy
PO4P
TotP
0.0
13.17
7.50
8.16
10.0
12.68
7.50
8.14
20.0
5.54
7.59
8.57
30.0
4.85
7.65
8.40
40.0
4.05
7.68
8.29
50.0
2.90
7.77
8.29
60.0
2.31
7.99
7.28
70.0
3.54
9.31
3.03
Time-series...

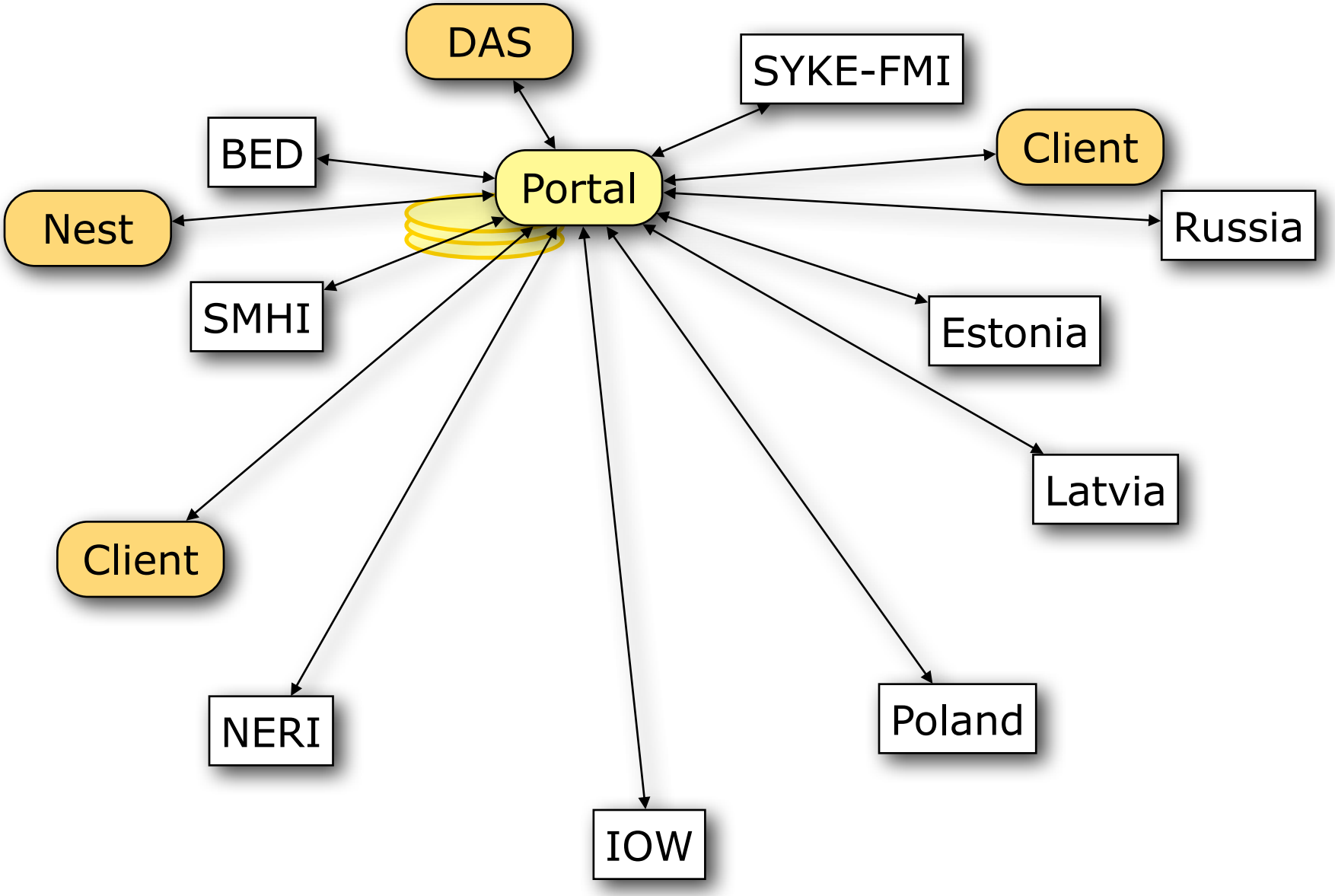

Baltic Nest
Time-series analysis
Data
Season
Trend
Temperature, Gotland deep
0
50
100
150
200
250
19.50
15.50
11.50
7.50
3.50
Plot
Data
Temperature [°C]
Options
Draw
ine model
Watershed model
Averaging interval (days):
30
Gotland deep
Request
Longitude
Date
Ship
20°10′ 1970-01... Skagerak
20°21′ 1970-01... Skagerak
19°44′ 1970-01... Skagerak
19°26′ 1970-01... Skagerak
20°03′ 1970-01... Skagerak
4 78736 1972-07-02 16:00 GMT 57°21′N 20°13′E ARANDA
Depth Temp Salin TotOxy PO4P TotP
0.0 13.17 7.50 8.16
10.0 12.68 7.50 8.14
20.0 5.54 7.59 8.57
30.0 4.85 7.65 8.40
40.0 4.05 7.68 8.29
50.0 2.90 7.77 8.29
60.0 2.31 7.99 7.28
70.0 3.54 9.31 3.03
Time-series...


Baltic Nest
Time-series analysis
Data
Season
Trend
Temperature, Gotland deep
0
50
100
150
200
250
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
19.50
15.50
11.50
7.50
3.50
Plot
Data
Temperature [°C]
Options
Draw
Watershed model
Averaging interval (days):
30
Gotland deep
Request
Longitude
Date
Ship
20°10′ 1970-01... Skagerak
20°21′ 1970-01... Skagerak
19°44′ 1970-01... Skagerak
19°26′ 1970-01... Skagerak
20°03′ 1970-01... Skagerak
4 78736 1972-07-02 16:00 GMT 57°21′N 20°13′E ARANDA
Depth
Temp
Salin
TotOxy
PO4P
TotP
0.0 13.17 7.50 8.16
10.0 12.68 7.50 8.14
20.0 5.54 7.59 8.57
30.0 4.85 7.65 8.40
40.0 4.05 7.68 8.29
50.0 2.90 7.77 8.29
60.0 2.31 7.99 7.28
70.0 3.54 9.31 3.03
Time-series...
Boxes are calculated using row data, orange line is a mean value


Baltic Nest
Time-series analysis
Data
Season
Trend
Temperature, Gotland deep, Horizon 30.0m
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Plot
Data
Temperature [°C]
Options
Draw
Watershed model
Averaging interval (days):
30
Gotland deep
Request
Longitude
Date
Ship
20°10′
1970-01...
Skagerak
20°21′
1970-01...
Skagerak
19°44′
1970-01...
Skagerak
19°26′
1970-01...
Skagerak
20°03′
1970-01...
Skagerak
4 78736 1972-07-02 16:00 GMT 57°21′N 20°13′E ARANDA
Depth
Temp
Salin
TotOxy
PO4P
TotP
0.0 13.17 7.50 8.16
10.0 12.68 7.50 8.14
20.0 5.54 7.59 8.57
30.0 4.85 7.65 8.40
40.0 4.05 7.68 8.29
50.0 2.90 7.77 8.29
60.0 2.31 7.99 7.28
70.0 3.54 9.31 3.03
Time-series...
Boxes are calculated using row data, orange line is a mean value


Baltic Nest
Time-series analysis
Data
Season
Trend
Temperature, Gotland deep, Horizon 40.0m
6
5
4
3
Generalized Additive Model
Linear Model
95% confident interval
Plot
Data
Temperature [°C]
Options
Draw
Watershed model
Averaging interval (days):
30
Gotland deep
Request
Longitude
Date
Ship
20°10′
1970-01...
Skagerak
20°21′
1970-01...
Skagerak
19°44′
1970-01...
Skagerak
19°26′
1970-01...
Skagerak
20°03′
1970-01...
Skagerak
4 78736 1972-07-02 16:00 GMT 57°21′N 20°13′E ARANDA
Depth
Temp
Salin
TotOxy
PO4P
TotP
0.0 13.17 7.50 8.16
10.0 12.68 7.50 8.14
20.0 5.54 7.59 8.57
30.0 4.85 7.65 8.40
40.0 4.05 7.68 8.29
50.0 2.90 7.77 8.29
60.0 2.31 7.99 7.28
70.0 3.54 9.31 3.03
Time-series...
Trend approximated by linear model and Generalised Additive Model (see R: lm(trend~x), gam(trend~s(x))


Browser
SYKE-FMI
Nest
Portal
Russia
BED
SMHI
Estonia
Latvia
DAS
Poland
NERI
IOW


DAS
SYKE-FMI
BED
Client
Portal
Nest
Russia
SMHI
Estonia
Latvia
Client
NERI
Poland
IOW

Thank you

http://nest.su.se

Stockholm University